

EXHIBIT 1

1 UNITED STATES DISTRICT COURT

2 DISTRICT OF MINNESOTA

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4 In Re:

5 Bair Hugger Forced Air Warming

6 Products Liability Litigation

7 MDL No. 15-2666 (JNE/FLN)

8 This Document Relates To:

9 Gareis v 3M Co., et al

10 - - - - -

11

12 DEPOSITION OF JOHN P. ABRAHAM, Ph.D.

13 VOLUME I, PAGES 1 - 290

14 FEBRUARY 15, 2018

15

16

17 (The following is the deposition of JOHN P.

18 ABRAHAM, Ph.D., taken pursuant to Notice of Taking

19 Deposition, via videotape, at the offices of Ciresi

20 Conlin L.L.P., 225 South 6th Street, Suite 4600, in

21 the City of Minneapolis, State of Minnesota,

22 commencing at approximately 9:05 o'clock a.m.,

23 February 15, 2018.)

24

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25		25
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1 PROCEEDINGS
 09:05:09 2 (Witness sworn.)
 3 JOHN P. ABRAHAM, Ph.D.,
 4 Called as a witness, being first
 5 duly sworn, was examined and
 6 testified as follows:
 7 EXAMINATION
 8 BY MR. ASSAAD:
 09:05:24 9 Q. Good morning.
 09:05:24 10 A. Good morning.
 09:05:26 11 Q. Please state your name.
 09:05:27 12 A. John Patrick Abraham.
 09:05:32 13 Q. And are you still a professor at St. Thomas?
 09:05:34 14 A. Yes.
 09:05:35 15 Q. Has anything changed with respect to your
 09:05:38 16 employment at St. Thomas since the last time we took
 09:05:41 17 your deposition?
 09:05:42 18 A. No.
 09:05:47 19 Q. I'm going to go over the instructions again.
 09:05:49 20 I'm sure you've heard it before, but just going to do
 09:05:52 21 it for the record.
 09:05:53 22 I'm going to ask you numerous questions
 09:05:55 23 today. If you don't understand my question, please
 09:05:56 24 let me know. Is that fair?
 09:05:58 25 A. Yes.
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09:05:59 1 Q. If you answer the question that I have
 09:06:00 2 asked, I will assume that you understood the question.
 09:06:02 3 Fair enough?
 09:06:03 4 A. Yes.
 09:06:04 5 Q. If at any time you want to take a break, I
 09:06:06 6 just ask that you answer a pending question before you
 09:06:10 7 ask for a break. Fair enough?
 09:06:12 8 A. Yes.
 09:06:20 9 Q. Furthermore, I would like all your opinions
 09:06:24 10 to be within a reasonable degree of engineering
 09:06:27 11 certainty, therefore I don't -- if -- I want to try to
 09:06:32 12 avoid any guessing or any type of speculation. Do you
 09:06:34 13 understand?
 09:06:34 14 A. Yes.
 09:06:36 15 Q. And if you are going to guess or offer an
 09:06:38 16 estimate, just let us know beforehand that that's an
 09:06:40 17 approximation or an estimate and not an answer within
 09:06:44 18 a reasonable degree of engineering certainty. Fair
 09:06:45 19 enough?
 09:06:46 20 A. Yes.
 09:06:47 21 Q. Since our last deposition, have you been
 09:06:50 22 involved in any other depositions?
 09:06:52 23 A. Yes.
 09:06:54 24 Q. How many?
 09:06:56 25 A. One.
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09:06:57 1 Q. And what was that pertaining to?
 09:07:00 2 A. It was pertaining to an International Trade
 09:07:03 3 Commission case related to a patent dispute.
 09:07:11 4 Q. And who were the parties?
 09:07:15 5 A. The complainant is iRobot. The respondents
 09:07:21 6 involved multiple parties, including Black & Decker,
 09:07:26 7 Hoover, Bissell, B-I-S-S-E-L-L, I think, and other --
 09:07:34 8 there were other respondents as well.
 09:07:36 9 Q. And who were you retained by?
 09:07:38 10 A. Pillsbury. I believe it's Pillsbury Shaw
 09:07:41 11 Whitman out of Washington, D.C.
 09:07:44 12 Q. And who did they represent?
 09:07:47 13 A. They represented the respondents.
 09:07:49 14 Q. All of them?
 09:07:51 15 A. I don't believe so.
 09:07:53 16 Q. Which ones, if you know?
 09:07:54 17 A. The ones I mentioned. But there were
 09:07:57 18 multiple respondents, and I -- there were others that
 09:08:00 19 I -- I don't recall the names of.
 09:08:02 20 Q. And what was your role in the case?
 09:08:05 21 A. I was an --
 09:08:06 22 I am an expert witness on the topic of
 09:08:10 23 patent infringement.
 09:08:18 24 Q. Was your focus on any part of -- Well wha --
 09:08:22 25 Strike that.
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09:08:22 1 What was the device or the patent that was
 09:08:24 2 allegedly to be infringed?
 09:08:26 3 A. Vacuum cleaners.
 09:08:29 4 Q. When we talk about the iRobot, are you
 09:08:30 5 talking about those vacuums that just go along the
 09:08:33 6 floor automatically?
 09:08:34 7 A. Yes.
 09:08:35 8 Q. Okay. And did you focus on any particular
 09:08:38 9 aspect or patent in this litigation?
 09:08:41 10 A. Yes.
 09:08:42 11 Q. What was the patent regarding?
 09:08:45 12 A. The patent was regarding the -- mainly the
 09:08:49 13 construction and components of the robots. The last
 09:08:54 14 numbers of the patents, the last three numbers are
 09:08:57 15 '090 and '233. I don't remember the full numbers of
 09:09:01 16 the patents.
 09:09:02 17 Q. And when was your deposition in this case --
 09:09:05 18 in that case?
 09:09:06 19 A. December 2017.
 09:09:09 20 Q. And was it here locally?
 09:09:11 21 A. No.
 09:09:11 22 Q. Was it in Washington, D.C.?
 09:09:13 23 A. Yes.
 09:09:33 24 Q. Is there anything in your field or in your
 09:09:35 25 expertise that was specific to the patent of -- that
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09:09:42 **1** involved the iRobot?
 09:09:44 **2** **A.** Yes.
 09:09:44 **3** **Q.** What?
 09:09:46 **4** **A.** The whole field of mechanical engineering,
 09:09:49 **5** which involves many disci -- subdisciplines, including
 09:09:55 **6** the manufacture, assembly and construction of the
 09:10:00 **7** robots, the sensors used by the robots, and the
 09:10:06 **8** airflow and particle accumulation performed by the
 09:10:13 **9** robots.
 09:10:14 **10** **Q.** Did you do any calculations with respect to
 09:10:18 **11** the airflow or to the particle accumulation with
 09:10:20 **12** respect to iRobot?
 09:10:21 **13** **A.** I did not.
 09:10:23 **14** **Q.** Did you perform any type of CFD analysis?
 09:10:25 **15** **A.** I did not.
 09:10:36 **16** **Q.** Do any of the patents deal with fluid
 09:10:41 **17** dynamics?
 09:10:42 **18** **A.** Yes.
 09:10:43 **19** **Q.** Which one, the '090, '233, or both?
 09:10:47 **20** **A.** Both.
 09:10:56 **21** **Q.** Did you offer any opinions in those cases
 09:10:59 **22** with respe -- or in that case with respect to particle
 09:11:03 **23** accumulation?
 09:11:04 **24** **A.** No.
 09:11:05 **25** **Q.** What about with respect to airflow?
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09:11:07 **1** **A.** No.
 09:11:14 **2** **Q.** Any other depositions between the last time
 09:11:17 **3** you and I met and today?
 09:11:19 **4** **A.** No.
 09:11:21 **5** **Q.** Are you involved in any other cases as an
 09:11:23 **6** expert witness that is not listed on your CV?
 09:11:32 **7** **A.** I don't believe so. I don't know how
 09:11:33 **8** current that CV is, if -- but I don't believe there
 09:11:37 **9** are any others.
 09:11:40 **10** **Q.** Are you still a consultant for 3M?
 09:11:44 **11** **A.** I'm not a consultant for 3M.
 09:11:50 **12** **Q.** Well on -- on your CV you state from 2015 to
 09:11:55 **13** 2017, under the title "CONSULTANTSHIPS" you have "3M."
 09:12:01 **14** **A.** Right. And that is no longer -- I'm no
 09:12:03 **15** longer a consultant for 3M.
 09:12:05 **16** **Q.** When did that terminate?
 09:12:06 **17** **A.** According to the -- my CV, that was finished
 09:12:10 **18** in 2017.
 09:12:11 **19** **Q.** At what point in 2017?
 09:12:15 **20** **A.** I would estimate around June or -- June.
 09:12:19 **21** **Q.** Okay. And what type of consulting were you
 09:12:22 **22** doing for 3M up till June?
 09:12:24 **23** **A.** It was related to the grants associated with
 09:12:28 **24** the simulation for this case.
 09:12:30 **25** **Q.** Okay. And we're talking about the two
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09:12:38 **1** grants, the one for \$12,000 and other for \$14,000;
 09:12:41 **2** correct?
 09:12:42 **3** **A.** That's correct.
 09:12:59 **4** **Q.** Are you involved in any other cases that
 09:13:01 **5** deal with -- when I say "cases," litigation cases --
 09:13:07 **6** that deal with fluid dynamics or computational fluid
 09:13:13 **7** dynamics?
 09:13:20 **8** **A.** No cases that deal with computational fluid
 09:13:23 **9** dynamics.
 09:13:24 **10** **Q.** Okay. What about with just fluid dynamics?
 09:13:28 **11** **A.** Well insofar as I'm involved in some cases
 09:13:31 **12** related to burn injuries that involve spills of hot
 09:13:34 **13** liquids, then yes.
 09:13:36 **14** **Q.** Okay. You understand that you've been
 09:13:44 **15** designated as an expert witness on behalf of 3M in the
 09:13:49 **16** Gareis case.
 09:13:51 **17** **A.** Yes.
 09:13:52 **18** **Q.** And you understand, as an expert witness,
 09:13:54 **19** you should be objective.
 09:13:56 **20** **A.** Yes.
 09:13:57 **21** **Q.** You should not be an advocate for either
 09:14:00 **22** side; correct?
 09:14:01 **23** **A.** Yes.
 09:14:16 **24** **Q.** You understand, as a professor of
 09:14:17 **25** engineering as well as an expert, that providing false
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09:14:21 **1** data or results would be considered fraudulent.
 09:14:26 **2** **A.** Yes.
 09:14:29 **3** **Q.** And providing false data or results in any
 09:14:33 **4** type of report or publication would be considered
 09:14:38 **5** research fraud.
 09:14:40 **6** **MR. GOSS:** Object to form.
 09:14:42 **7** **Q.** Do you agree with that?
 09:14:44 **8** **A.** Usually research fraud is used in the
 09:14:46 **9** context of scholarly work, published work. So unless
 09:14:53 **10** there's a specific definition of research fraud that
 09:14:55 **11** you'd like to give, I don't know if I can answer that.
 09:14:59 **12** **Q.** How would you define "research fraud"?
 09:15:02 **13** **A.** Well I would define it through example. If
 09:15:08 **14** you fabricated results and then published those
 09:15:10 **15** results as a scholarly article, I would call that
 09:15:14 **16** research fraud.
 09:15:22 **17** **Q.** Would you consider leaving results that do
 09:15:27 **18** not support your position out of the paper, research
 09:15:30 **19** fraud?
 09:15:34 **20** **A.** If they were contrary to your conclusion,
 09:15:39 **21** then yes.
 09:15:49 **22** **Q.** You understand that you're under oath today;
 09:15:51 **23** correct?
 09:15:52 **24** **A.** Yes.
 09:15:52 **25** **Q.** And that's under a penal --
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09:15:54 **1** When you're under oath you're under a
 09:15:56 **2** penalty of perjury. Do you understand that?
 09:15:59 **3** **A.** Yes.
 09:16:04 **4** **Q.** And you understand that my goal here today
 09:16:06 **5** is to understand the full scope of your opinions.
 09:16:09 **6** **A.** Yes.
 09:16:12 **7** MR. GOSS: In the Gareis case; correct?
 09:16:15 **8** The opinions he will offer at trial on the Gareis
 09:16:19 **9** matter.
 09:16:19 **10** MR. ASSAAD: Yes.
 09:16:19 **11** MR. GOSS: Okay.
 09:16:21 **12** **Q.** And to understand all the methodologies on
 09:16:24 **13** how you reached your opinions. Do you understand
 09:16:25 **14** that? That's one of the goals here today.
 09:16:28 **15** **A.** Yes.
 09:16:45 **16** **Q.** Would it be accurate to summarize your
 09:16:50 **17** entire opinion as saying that it is your opinion that
 09:16:53 **18** the Bair Hugger 505 does not disrupt the
 09:16:57 **19** unidirectional airflow?
 09:16:58 **20** MR. GOSS: Object to form.
 09:17:00 **21** **A.** That is one opinion.
 09:17:09 **22** **Q.** In forming your conclusions or your
 09:17:12 **23** opinions, you relied on -- on data that is reliable;
 09:17:17 **24** correct?
 09:17:23 **25** **A.** That's a cumbersome question, but I would
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09:17:25 **1** say this. I believe my data are reliable. My opinion
 09:17:28 **2** is my data's reliable.
 09:17:30 **3** **Q.** Okay. I mean, your opinion is based on
 09:17:33 **4** reliable data; correct?
 09:17:35 **5** **A.** Anything that went into forming my opinion,
 09:17:38 **6** I understand to be reliable.
 09:17:39 **7** **Q.** You would not rely on unreliable data in
 09:17:43 **8** formulating your opinion; correct?
 09:17:44 **9** **A.** Correct.
 09:17:45 **10** **Q.** And you wouldn't refer to a article or to
 09:17:51 **11** data that you believed was unreliable.
 09:17:55 **12** **A.** What does "referred" mean?
 09:17:58 **13** **Q.** In a citation, for example, in your paper,
 09:18:01 **14** or to data in your expert report.
 09:18:03 **15** **A.** That's not true.
 09:18:05 **16** **Q.** You would refer to unreliable data?
 09:18:08 **17** **A.** If someone else has an alternative
 09:18:14 **18** explanation which I disagree with, I would reference
 09:18:17 **19** it, and it's my obligation to say why I disagree with
 09:18:21 **20** it.
 09:18:22 **21** **Q.** I understand that.
 09:18:23 **22** Maybe I should ask the question this way:
 09:18:25 **23** You wouldn't refer to unreliable data to support your
 09:18:30 **24** opinion or your conclusions.
 09:18:36 **25** **A.** If I had unreliable data that didn't support
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09:18:40 **1** my opinion or conclusions, I would try to explain why
 09:18:46 **2** I think it's unreliable. I wouldn't ignore anything
 09:18:50 **3** that I felt was unreliable.
 09:18:53 **4** **Q.** I think you misunderstood my question a
 09:18:54 **5** little bit, and maybe it was not a articulate
 09:18:57 **6** question.
 09:18:57 **7** You wouldn't rely on data to support your
 09:19:04 **8** opinions if you know that the data is unreliable.
 09:19:13 **9** **A.** I mean, it depends. It depends on what do
 09:19:18 **10** you mean by "unreliable"? Is unreliable something
 09:19:23 **11** that I -- isn't validated? Is the data part of a
 09:19:29 **12** broader collection of data and I'm...
 09:19:31 **13** When you look at a result and -- or you have
 09:19:36 **14** a conclusion you look for other evidence that supports
 09:19:42 **15** or refutes your opinions. And that supporting
 09:19:50 **16** information may come from all kinds of places; some of
 09:19:53 **17** it may be reliable, some of it may not be reliable. I
 09:19:59 **18** think it's important to distinguish the two and not --
 09:20:04 **19** I wouldn't throw away data that is unreliable just
 09:20:09 **20** because it's unreliable.
 09:20:16 **21** **Q.** For example, if you were doing research and
 09:20:25 **22** the data that you rely -- were relying upon; say, for
 09:20:29 **23** example, airflow data, and it was discovered that the
 09:20:35 **24** instrument to collect that airflow data was not
 09:20:39 **25** calibrated properly, would you agree with me that you
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09:20:43 **1** would not use that data or refer to that data to
 09:20:47 **2** support your research?
 09:20:49 **3** **A.** I disagree.
 09:20:50 **4** What I would do, if I used data that was
 09:20:54 **5** collected by a non-calibrated instrument, for
 09:20:59 **6** instance, and if I relied on that data, I would
 09:21:02 **7** acknowledge that there's some uncertainty in the
 09:21:05 **8** input, and that da -- and the uncertainty is the data
 09:21:08 **9** was collected by a non-calibrated instrument.
 09:21:10 **10** But we have many instances, in fact it's
 09:21:12 **11** more likely than not that a non-calibrated
 09:21:16 **12** instrument's still going to give you the right
 09:21:18 **13** results. But it's important to acknowledge
 09:21:20 **14** uncertainty. You don't just throw things away because
 09:21:24 **15** an instrument's uncalibrated. It goes to the weight
 09:21:26 **16** that you give that information.
 09:21:28 **17** **Q.** But you would definitely acknowledge the
 09:21:31 **18** limitation or the uncertainty.
 09:21:32 **19** **A.** If there was a limitation or an uncertainty
 09:21:39 **20** that was important to the conclusion, so I'm talking
 09:21:43 **21** about something that's nonnegligible, then yes.
 09:21:48 **22** **Q.** Yes, you would acknowledge it.
 09:21:50 **23** **A.** Yes.
 09:22:01 **24** **Q.** You reviewed your report for accuracy before
 09:22:03 **25** today's deposition?
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09:22:04 **1** A. Yes.

09:22:05 **2** Q. Any changes you'd like to make to your

09:22:07 **3** report before we begin?

09:22:09 **4** A. Not at this time.

09:22:12 **5** Q. At any time?

09:22:12 **6** A. Well if -- if I discover something today

09:22:15 **7** that's not correct, then I'll make changes. But

09:22:18 **8** there's no changes that I -- There's no errors in the

09:22:21 **9** report that I'm aware of now.

09:22:23 **10** Q. Have you received Dr. Elghobashi's report?

09:22:28 **11** A. Yes.

09:22:29 **12** Q. Have you received his data and his

09:22:33 **13** PowerPoint, which include the graphs and the videos?

09:22:36 **14** A. I have not received his data. I have

09:22:38 **15** received a PowerPoint.

09:22:39 **16** Q. Okay. And the Power -- What about his

09:22:44 **17** calculations -- Strike that.

09:22:50 **18** What have you received recently from Dr.

09:22:56 **19** Elghobashi?

09:22:58 **20** A. Via counsel I have received some

09:23:02 **21** PowerPoints, there were some OR photos which I think I

09:23:07 **22** had already seen, and there was a report. And that's

09:23:11 **23** all I can recall right now.

09:23:14 **24** Q. The report --

09:23:15 **25** His original report, or was it a supplement

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09:23:17 **1** to his report?

09:23:18 **2** A. The report related to the Gareis case.

09:23:21 **3** Q. Okay. And when did you see -- receive the

09:23:25 **4** PowerPoint?

09:23:27 **5** A. I don't recall the date. I mean, it was

09:23:29 **6** recent, but I don't recall.

09:23:30 **7** Q. Have you reviewed them?

09:23:31 **8** A. Yes.

09:23:32 **9** Q. And did the PowerPoint contain graphs that

09:23:36 **10** discussed squame cell deposits in certain areas of the

09:23:41 **11** operating room?

09:23:42 **12** A. I be --

09:23:42 **13** If I recall correctly, yes, there were --

09:23:44 **14** was a graph or graphs.

09:23:46 **15** Q. And did it also contain the videos of

09:23:49 **16** particles moving in the operating room?

09:23:53 **17** A. You know, I don't recall if there was a

09:23:54 **18** video of part...

09:23:55 **19** I don't recall if that video was embedded.

09:23:59 **20** Q. Were there videos?

09:24:00 **21** A. Yes.

09:24:00 **22** Q. Okay. And you've had a chance to review

09:24:06 **23** those documents; correct?

09:24:07 **24** A. Yes.

09:24:07 **25** Q. Are you ready to discuss them today?

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09:24:09 **1** A. Yes.

09:24:10 **2** Q. Is there anything else that you would need

09:24:13 **3** or is missing from Dr. Elghobashi to discuss today?

09:24:18 **4** A. Well for a complete discussion, yes, there

09:24:20 **5** is.

09:24:21 **6** Q. What --

09:24:21 **7** A. I can dis --

09:24:22 **8** What I am prepared to discuss is the

09:24:25 **9** information that he provided in his PowerPoint and in

09:24:27 **10** his supplemental report, but none of the data was

09:24:31 **11** actually ever provided, nor was the code provided.

09:24:36 **12** Q. To you.

09:24:36 **13** A. That's correct.

09:24:37 **14** Q. Okay. Based on the review of Dr.

09:24:58 **15** Elghobashi's report and the PowerPoint that contains

09:25:00 **16** the graph and videos, are there any changes that you

09:25:03 **17** would like to make to your report?

09:25:05 **18** A. None.

09:25:32 **19** Q. You stand by your report?

09:25:34 **20** A. Yes.

09:25:36 **21** MR. GOSS: We're talking about the Gareis

09:25:38 **22** report?

09:25:38 **23** MR. ASSAAD: Yes.

09:25:40 **24** MR. GOSS: I mean, or -- or both reports.

09:25:41 **25** MR. ASSAAD: I'll address that.

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09:25:41 **1** BY MR. ASSAAD:

09:25:43 **2** Q. Have you changed your position on your

09:25:44 **3** general causation report?

09:25:46 **4** A. No.

09:25:47 **5** Q. Okay.

09:25:48 **6** MR. GOSS: Just to be clear.

09:26:02 **7** Q. Are there any other opinions that you would

09:26:03 **8** like to add to your report before we begin?

09:26:14 **9** A. Yes.

09:26:14 **10** Q. What?

09:26:19 **11** A. I believe Elghobashi stated at his

09:26:24 **12** deposition that the elevated return vent on the wall

09:26:31 **13** in the Providence OR -- and I'm using the term

09:26:34 **14** "Providence OR" because I think it was the Providence

09:26:40 **15** Hospital -- he opined that that would make it more

09:26:42 **16** likely Bair Hugger air would intrude into the

09:26:47 **17** operating theater, and I disagree with that.

09:26:54 **18** Q. Anything else?

09:27:16 **19** A. Not at this... No.

09:27:22 **20** Hmm. Yes.

09:27:24 **21** Q. Hold on one second, please, while I write

09:27:26 **22** this down.

09:27:36 **23** Before you get to that opinion. Are you

09:27:38 **24** saying that you disagree that the Bair Hugger would

09:27:40 **25** allow more particles into the operating theater, or

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09:27:44 **1** over the sterile field, or both?

09:27:52 **2** **A.** Let me just restate it. Maybe I can make it

09:27:55 **3** clearer.

09:27:55 **4** It's my --

09:27:58 **5** **Q.** You really going to make me cross out what I

09:28:00 **6** just wrote down?

09:28:01 **7** **A.** I might.

09:28:01 **8** **Q.** Fair enough.

09:28:02 **9** **A.** It is my understanding, at his deposition,

09:28:06 **10** that Dr. Elghobashi gave an opinion that the elevated

09:28:13 **11** exhaust vent in the Providence OR would make it easier

09:28:18 **12** for Bair Hugger air to get over the operating table.

09:28:24 **13** Now operating theater/surgical site, I'll lump those

09:28:29 **14** together as above the operating table.

09:28:31 **15** **Q.** Okay.

09:28:31 **16** **A.** I disagree with that opinion.

09:28:34 **17** **Q.** Fair enough.

09:28:34 **18** That's what I wanted to clarify, because you

09:28:37 **19** mentioned "operating theater," and I don't think Dr.

09:28:42 **20** Elghobashi opined that the Bair Hugger actually

09:28:45 **21** creates more particles out of nothing, it was where

09:28:50 **22** the particles would go. So you're saying over the

09:28:52 **23** operating table.

09:28:52 **24** **A.** Well I'm not --

09:28:54 **25** I don't know if I used the word particles in

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09:28:55 **1** my answer. I'm talking about the airflow.

09:28:58 **2** **Q.** Okay.

09:29:01 **3** **A.** In summary, he thinks the elevated vent

09:29:05 **4** would make it easier for Bair Hugger air to travel,

09:29:08 **5** and I disagree.

09:29:10 **6** **Q.** Okay. And what is your other opinion?

09:29:14 **7** **A.** I think my other opinion was actually in my

09:29:17 **8** sup -- my report, so I don't need to make a

09:29:19 **9** modification.

09:29:20 **10** **Q.** And which opinion is that referring to?

09:29:22 **11** **A.** It was related to the positioning of the

09:29:25 **12** ceiling vents in the Providence OR.

09:29:26 **13** **Q.** You consider yourself ethical; correct?

09:29:36 **14** **A.** Yes.

09:29:41 **15** **Q.** As an engineer; correct?

09:29:42 **16** **A.** I am an engineer and I consider myself

09:29:44 **17** ethical.

09:29:45 **18** **Q.** An ethical engineer?

09:29:46 **19** **A.** Well I am ethical, and I am an engineer, so

09:29:49 **20** yes, an ethical engineer.

09:29:51 **21** **Q.** Do you consider yourself an ethical author

09:29:53 **22** of publications?

09:29:54 **23** **A.** Yes.

09:29:55 **24** **Q.** Do you consider yourself an ethical

09:29:57 **25** scientist?

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09:29:59 **1** **A.** Yes.

09:30:15 **2** **Q.** Are you a reviewer for any journals?

09:30:19 **3** **A.** Yes.

09:30:19 **4** **Q.** What journals?

09:30:21 **5** **A.** Too many to count. I mean, many. I get

09:30:24 **6** review requests weekly.

09:30:27 **7** **Q.** Any --

09:30:28 **8** Can you just give me a list of the main

09:30:32 **9** journals?

09:30:38 **10** **A.** I don't think I can. I mean, there's so

09:30:39 **11** many. I have probably reviewed for over a hundred

09:30:42 **12** journals, so. I got a review request today for a,

09:30:50 **13** like a mathematical and applied physics journal paper

09:30:54 **14** today.

09:30:55 **15** I don't list review activities in my CV

09:30:58 **16** because they are trivial, and they're a service, not a

09:31:03 **17** publica -- not a -- they're not scholarly

09:31:11 **18** productivity. I consider them a service.

09:31:14 **19** **Q.** Fair enough.

09:31:32 **20** For example, do you review for *Atmospheric*

09:31:36 **21** *and Oceanic Science Letters*?

09:31:38 **22** **A.** I think I have, but I can't say for sure.

09:31:41 **23** **Q.** What about the *Journal of Biomedical Science*

09:31:45 **24** *and Engineering*?

09:31:46 **25** **A.** I believe I have reviewed for that journal.

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09:31:49 **1** **Q.** What about *Numerical Heat Transfer*?

09:31:53 **2** **A.** I don't know if I've reviewed for that

09:31:54 **3** journal.

09:31:57 **4** **Q.** And would that include Part A?

09:31:59 **5** **A.** Correct.

09:32:03 **6** **Q.** What about the *International Journal of Heat*

09:32:05 **7** *and Mass Transfer*?

09:32:06 **8** **A.** I have reviewed for that journal.

09:32:11 **9** **Q.** What about for the *Journal of Medical*

09:32:13 **10** *Devices*?

09:32:15 **11** **A.** I don't recall.

09:32:28 **12** **Q.** What about the journal for -- of

09:32:30 **13** *International Communications in Heat and Mass*

09:32:33 **14** *Transfer*?

09:32:33 **15** **A.** I believe I have reviewed for that journal.

09:32:36 **16** **Q.** What about *Frontiers in Heat Transfer*?

09:32:40 **17** **A.** I don't recall reviewing for that journal.

09:32:58 **18** **Q.** Now when you perform research or act as a

09:33:01 **19** consultant you expect others to -- you put out a

09:33:04 **20** product; correct? A paper -- A paper or some -- or a

09:33:09 **21** memo, depending on the type of job you're doing;

09:33:12 **22** correct?

09:33:12 **23** **A.** Typically, yes.

09:33:14 **24** **Q.** And you expect others to review the work

09:33:18 **25** that you put out; correct?

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09:33:21 **1** **A.** Will I expect others to read it, if it's an
 09:33:24 **2** article or a -- a memo? So insofar as if it's a memo,
 09:33:31 **3** let's say, that goes to a company, then I would expect
 09:33:34 **4** someone to read it. Whether you call that a review, I
 09:33:36 **5** don't -- I don't know if I would call that a review.
 09:33:38 **6** **Q.** That's what I meant by "review," like read
 09:33:40 **7** it, look at it.
 09:33:41 **8** **A.** I would expect my product -- my -- whatever
 09:33:43 **9** I produce is reviewed.
 09:33:44 **10** **Q.** And when you act as a consultant, the
 09:33:47 **11** companies that you consult for rely on your data or
 09:33:53 **12** work product.
 09:33:54 **13** **A.** That is true.
 09:33:56 **14** **Q.** And they rely on your conclusions; correct?
 09:33:58 **15** **MR. GOSS:** Object to form, foundation.
 09:34:01 **16** **A.** That may be true.
 09:34:03 **17** **Q.** And in some cases your results -- your
 09:34:06 **18** results or your research is used to market products.
 09:34:11 **19** **A.** Yes.
 09:34:14 **20** **Q.** For example, 3M uses your work in this case
 09:34:19 **21** to market the Bair Hugger and discuss their perception
 09:34:27 **22** of the safety of Bair Hugger.
 09:34:29 **23** **A.** I don't --
 09:34:30 **24** **MR. GOSS:** Object to form.
 09:34:31 **25** **A.** I don't know if that's true.
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09:34:32 **1** **Q.** Do you understand that your streamline
 09:34:36 **2** videos are on 3M websites?
 09:34:38 **3** **A.** I don't know that.
 09:34:42 **4** **Q.** Have you ever typed your name into Google
 09:34:44 **5** and type in "John Abraham" and "Bair Hugger"?
 09:34:48 **6** **A.** I don't recall ever typing in John Abraham
 09:34:50 **7** and Bair Hugger.
 09:34:59 **8** **Q.** Have you reviewed any depositions in
 09:35:02 **9** preparation of your deposition today?
 09:35:04 **10** **A.** Yes.
 09:35:05 **11** **Q.** Besides Dr. Elghobashi, any others?
 09:35:07 **12** **A.** Yes.
 09:35:08 **13** **Q.** What depositions?
 09:35:10 **14** **A.** Rauch, R-A-U-C-H, is the last name.
 09:35:14 **15** **Q.** Umm-hmm. Any others?
 09:35:16 **16** **A.** No.
 09:35:19 **17** **Q.** Have you reviewed any expert reports in
 09:35:22 **18** preparation of your opinions in this case?
 09:35:24 **19** **A.** Yes.
 09:35:25 **20** **Q.** What expert reports?
 09:35:28 **21** **A.** The expert report from Elghobashi.
 09:35:31 **22** **Q.** Any others?
 09:35:33 **23** **A.** No.
 09:35:34 **24** **Q.** Have you reviewed the expert report of Dr.
 09:35:37 **25** Stonnington?
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09:35:38 **1** **A.** No.
 09:35:38 **2** **Q.** Have you read the deposition of Dr.
 09:35:40 **3** Stonnington?
 09:35:41 **4** **A.** No.
 09:35:42 **5** **Q.** Have you read the expert report of Dr.
 09:35:48 **6** Jarvis?
 09:35:49 **7** **A.** No.
 09:35:51 **8** **Q.** Have you read the deposition of Dr. Jarvis?
 09:35:53 **9** **A.** No.
 09:35:56 **10** **Q.** With respect to defendant's experts, have
 09:35:59 **11** you reviewed the expert report of Mr. Keen?
 09:36:03 **12** **A.** No.
 09:36:04 **13** **Q.** Have you read the deposition of Mr. Keen?
 09:36:06 **14** **A.** No.
 09:36:07 **15** **Q.** Have you reviewed the expert report of Dr.
 09:36:10 **16** Wenzel?
 09:36:11 **17** **A.** No.
 09:36:12 **18** **Q.** Have you seen his deposti --
 09:36:16 **19** Have you reviewed his deposition, Dr.
 09:36:18 **20** Wenzel's?
 09:36:18 **21** **A.** No.
 09:36:22 **22** **Q.** Have you been provided the report of Dr.
 09:36:25 **23** Mont?
 09:36:26 **24** **A.** No.
 09:36:28 **25** **Q.** Have you reviewed his -- the deposition of
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09:36:30 **1** Dr. Mont?
 09:36:31 **2** **A.** No.
 09:36:49 **3** **Q.** Have you reviewed the deposition -- Or
 09:36:51 **4** strike that.
 09:36:52 **5** Have you been provided the report of Dr.
 09:36:55 **6** Borak?
 09:36:56 **7** **A.** No.
 09:36:57 **8** **Q.** Have you reviewed the deposition of Dr.
 09:36:58 **9** Borak?
 09:36:59 **10** **A.** No.
 09:37:00 **11** **Q.** Have you been provided the report of Dr. --
 09:37:03 **12** strike that -- of Ms. Hughes?
 09:37:06 **13** **A.** No.
 09:37:07 **14** **Q.** Have you read the deposition of Ms. Hughes?
 09:37:09 **15** **A.** No.
 09:37:12 **16** **MR. GOSS:** You almost got him there.
 09:37:50 **17** **Q.** Have you performed any experiments with
 09:37:54 **18** respect to the Gareis case?
 09:37:56 **19** **A.** No.
 09:38:00 **20** **Q.** Are you preparing or submitting any
 09:38:02 **21** manuscripts with respect to the Gareis case?
 09:38:05 **22** **A.** No.
 09:38:05 **23** **Q.** Are you submitting any manuscripts with
 09:38:07 **24** respect to the 505?
 09:38:10 **25** **A.** No.
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09:38:11 **1** Q. When I say "505" you understand it to mean
 09:38:13 **2** the Bair Hugger Model 505.
 09:38:15 **3** A. Yes.
 09:38:15 **4** (Abraham Exhibit 1 marked for
 09:38:15 **5** identification.)
 09:38:15 **6** BY MR. ASSAAD:
 09:38:40 **7** Q. What's been marked as Exhibit 1 is titled
 09:38:44 **8** "Case-Specific Report in Gareis versus 3M and Response
 09:38:48 **9** to Supplemental Report of Dr. Said Elghobashi," dated
 09:38:53 **10** December 18th, 2017.
 09:38:56 **11** Do you recognize this -- this document,
 09:39:00 **12** Exhibit 1?
 09:39:02 **13** A. Yes, I do.
 09:39:03 **14** Q. Is this a complete copy of your expert
 09:39:07 **15** report submitted in this case?
 09:39:10 **16** A. Yes, it is.
 09:39:18 **17** Q. And it's my understanding that this report
 09:39:20 **18** deals with the Bair Hugger Model 505; correct?
 09:39:27 **19** A. That's correct.
 09:39:28 **20** Q. And this is the result of a grant provided
 09:39:32 **21** to you for the amount of \$14,000 by 3M; correct?
 09:39:37 **22** A. Correct.
 09:39:46 **23** Q. And it's my understanding that you ran the
 09:39:56 **24** model for the 505 until you've obtained quasi-steady
 09:40:01 **25** results; correct?

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09:40:02 **1** A. Yes.
 09:40:03 **2** Q. What is your definition of "quasi-steady"?
 09:40:07 **3** A. When the flow patterns are not meaningfully
 09:40:11 **4** changing over time.
 09:40:18 **5** Q. And when you say flow -- Well strike that.
 09:40:20 **6** How do you define the word "meaningfully"?
 09:40:24 **7** A. Enough to affect the conclusions.
 09:40:27 **8** Q. Is there a percentage that you're looking
 09:40:28 **9** at?
 09:40:29 **10** A. No.
 09:40:31 **11** Q. So when you say "affect the conclusions,"
 09:40:35 **12** what do you mean "affect the conclusions"?
 09:40:37 **13** A. Well in this case I looked at the flow
 09:40:43 **14** patterns --
 09:40:43 **15** Q. I don't mean to stop you. I don't -- I'm
 09:40:46 **16** talking about generally. I don't want to --
 09:40:49 **17** I'm trying to get the definition generally,
 09:40:51 **18** not with respect to this case. Is that fair enough?
 09:40:53 **19** You understand?
 09:40:54 **20** A. Okay. Yes.
 09:40:57 **21** Q. So how would you define a meaningful -- a
 09:41:04 **22** non-meaningful change that does not affect the
 09:41:06 **23** conclusions?
 09:41:14 **24** A. If a change would affect the conclusions,
 09:41:16 **25** that would be a meaningful change.

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09:41:37 **1** Q. With respect to computational fluid
 09:41:40 **2** dynamics, when you use the term quasi-steady and
 09:41:42 **3** you're looking for a meaningful change, what are you
 09:41:45 **4** looking at exactly; what data?
 09:41:49 **5** A. Well what I was looking at was the pattern
 09:41:51 **6** of airflow, which I represent by the streamlines. So
 09:41:57 **7** what I did was something very similar to what Said
 09:42:00 **8** Elghobashi did. He used the term steady-state plumes,
 09:42:07 **9** and that's equivalent to -- he may have used the term
 09:42:10 **10** just steady state, and that is when the flow patterns
 09:42:17 **11** are not meaningfully changing over time.
 09:42:23 **12** Q. So you're looking at the streamlines.
 09:42:25 **13** A. Yes.
 09:42:26 **14** Q. Are you looking at temperature?
 09:42:33 **15** A. I used the streamlines to demonstrate
 09:42:37 **16** quasi-steady flow.
 09:42:39 **17** Q. I understand that. Did you look at --
 09:42:42 **18** Do you look at temperature as well to
 09:42:43 **19** determine quasi-steady?
 09:42:45 **20** A. I looked at temperature, but I used the
 09:42:47 **21** streamlines to determine quasi-steady.
 09:42:50 **22** Q. Okay. So just so I understand you, in your
 09:43:03 **23** 505 report you only looked at streamlines to determine
 09:43:09 **24** whether or not the results were quasi-steady.
 09:43:13 **25** A. That is correct.

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09:43:16 **1** Q. To determine quasi-steady you did not look
 09:43:19 **2** at the temperature; correct?
 09:43:20 **3** A. Correct.
 09:43:21 **4** Q. To determine quasi-steady you did not look
 09:43:24 **5** at the velocity of the air; correct?
 09:43:30 **6** A. Incorrect.
 09:43:30 **7** MR. GOSS: Object to form.
 09:43:31 **8** Q. You looked at the vel -- the actual velocity
 09:43:33 **9** -- not the vector, but the velocity.
 09:43:35 **10** A. Well insofar as the streamlines are made
 09:43:38 **11** from the vectors, from the velocity, yes, I did use
 09:43:41 **12** the velocity.
 09:43:42 **13** Q. Okay. Did you look at turbulence -- Strike
 09:44:00 **14** that.
 09:44:00 **15** To determine quasi-steady flow you did not
 09:44:05 **16** look at turbulence intensity; correct?
 09:44:07 **17** A. Correct.
 09:44:20 **18** Q. And over what period of time do you look for
 09:44:29 **19** a change?
 09:44:33 **20** A. I -- I think I used 60 seconds. So the
 09:44:40 **21** patterns of flow for 60 seconds.
 09:44:49 **22** Q. Is that somewhere in your report?
 09:44:51 **23** A. No. I don't think I listed that in my
 09:44:53 **24** report.
 09:45:15 **25** Q. And I assume that the 60 seconds was based

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09:45:20 **1** off the TRN file labeled 2540.TRN?

09:45:30 **2** **A.** No.

09:45:30 **3** **Q.** What was it off of?

09:45:31 **4** **A.** I used 60 seconds because I believe that is

09:45:34 **5** what Elghobashi had claimed. He opined that within

09:45:39 **6** approximately 60 seconds particles would be deposited

09:45:45 **7** in the surgical site.

09:45:47 **8** **Q.** Okay. So --

09:45:48 **9** **A.** I wanted to know, is that true.

09:45:50 **10** **Q.** My question is: Sixty seconds of streamline

09:45:58 **11** time, or 60 seconds of simulation time?

09:46:04 **12** **A.** The 60 seconds refers to the period that I'm

09:46:09 **13** tracking the airflow, so I'm tracking the airflow for

09:46:12 **14** 60 seconds. It is not simulation time.

09:46:16 **15** **Q.** Okay. So you're tracking the streamline for

09:46:18 **16** 60 seconds.

09:46:19 **17** **A.** That's right.

09:46:20 **18** **Q.** It is not 60 seconds of simulation time.

09:46:23 **19** **A.** That is correct.

09:46:24 **20** **Q.** And the 60 seconds of streamline tracking,

09:46:27 **21** is that based off the results in the 2540 TRN file?

09:46:34 **22** **A.** Yes.

09:46:35 **23** **Q.** No other TRN file was used to determine your

09:46:39 **24** quasi-steady?

09:46:40 **25** **A.** No, that's not true.

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09:46:41 **1** **Q.** You used other TRN files?

09:46:43 **2** **A.** Yes.

09:46:44 **3** **Q.** Which ones?

09:46:45 **4** **A.** Well I used many, and the whole point is to

09:46:49 **5** show that they don't meaningfully change over time.

09:46:52 **6** And then once you show that you've reached

09:46:53 **7** quasi-steady you show the results. And it doesn't

09:46:57 **8** matter which one you pick as long as you are

09:46:59 **9** quasi-steady.

09:47:44 **10** **MR. ASSAAD:** Let's take a break.

09:47:47 **11** **THE REPORTER:** Off the record, please.

09:47:49 **12** (Recess taken from 9:47 to 9:54 a.m.)

09:54:46 **13** **BY MR. ASSAAD:**

09:54:56 **14** **Q.** We were talking about quasi-steady and that

09:54:57 **15** you only looked at streamlines to determine

09:55:01 **16** quasi-steady flow; correct?

09:55:03 **17** **A.** Correct.

09:55:03 **18** **Q.** And you mentioned that you looked at it for

09:55:05 **19** 60 seconds; correct?

09:55:06 **20** **A.** Correct.

09:55:07 **21** **Q.** Why only 60 seconds?

09:55:09 **22** **A.** Because I recalled that was the time period

09:55:13 **23** Elghobashi used in his report. He opined that within

09:55:16 **24** 60 seconds or so the Bair Hugger particles, as he

09:55:21 **25** described them, would reach the surgical site.

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09:55:25 **1** **Q.** Okay. But you also used -- Did you --

09:55:32 **2** Strike that.

09:55:32 **3** Did you use 60 seconds with respect to your

09:55:35 **4** general causation report?

09:55:39 **5** **A.** I don't recall what I used with respect to

09:55:41 **6** my general causation report.

09:55:43 **7** **Q.** Okay. You agree that temperature can affect

09:55:59 **8** airflow; correct?

09:56:01 **9** **A.** Temperature can affect airflow.

09:56:03 **10** **Q.** You agree that turbulence can affect

09:56:05 **11** airflow; correct?

09:56:07 **12** **A.** I agree turbulence can affect airflow.

09:56:18 **13** **Q.** Now how do you determine that there is --

09:56:22 **14** when you're looking at the streamlines, that there's

09:56:25 **15** no meaningful change?

09:56:29 **16** **A.** Well what I do is I look to see if the

09:56:32 **17** streamlines from underneath the table or the Bair

09:56:36 **18** Hugger came anywhere near the operating theater or the

09:56:38 **19** surgical site, and if they haven't come anywhere near,

09:56:44 **20** and if any changes still don't bring them anywhere

09:56:46 **21** near, then it's not meaningful change.

09:56:49 **22** **Q.** Okay. So your definition of quasi-steady

09:56:54 **23** state in this case is that you do not see any

09:56:58 **24** streamlines going over the operating room table.

09:57:08 **25** **MR. GOSS:** Object to form.

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09:57:09 **1** **A.** No. That's not what I said my definition

09:57:12 **2** was.

09:57:30 **3** **Q.** So my understanding is when you look at

09:57:32 **4** streamlines to determine whether or not there is any

09:57:36 **5** meaningful change to determine quasi-steady, you're

09:57:42 **6** looking at the streamlines from underneath the table

09:57:44 **7** or the Bair Hugger and whether they come near the

09:57:50 **8** operating theater or the surgical site. Is that

09:57:52 **9** correct?

09:57:54 **10** **A.** I don't think that was my full answer.

09:58:02 **11** Maybe I could just answer it again and make

09:58:04 **12** it clearer.

09:58:05 **13** **Q.** Maybe. That's a good...

09:58:07 **14** So when you're looking at the streamlines to

09:58:09 **15** determine whether or not there is quasi-steady, hence

09:58:12 **16** there's no meaningful change, what are you looking at?

09:58:19 **17** **A.** I'm looking to see are the streamlines

09:58:25 **18** changing in time in a way that will bring them to --

09:58:31 **19** well are they changing meaningfully in time. And

09:58:35 **20** since the report that I wrote, and I believe in

09:58:40 **21** Elghobashi's supplemental report he opined 60 seconds,

09:58:47 **22** up to 60 seconds would be needed, and it's my

09:58:50 **23** understanding that, maybe it was at his deposition or

09:58:54 **24** -- I recall now 43 seconds, so he shortened his time

09:58:58 **25** period.

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09:58:59 **1** So if I were to do this again I would track
 09:59:02 **2** streamlines for 43 seconds and I would look at them
 09:59:07 **3** and I would see are they changing meaningfully, and
 09:59:11 **4** are they near the surgical site.
 09:59:16 **5** **Q.** Okay. From a CFD technical standpoint, what
 10:00:01 **6** is the process that you do to determine whether or not
 10:00:07 **7** the streamlines are changing meaningfully?
 10:00:12 **8** **A.** It's what I just described. You consider --
 10:00:16 **9** You look at the patterns of the streamlines, so for in
 10:00:19 **10** this -- It comes down to what question you're trying
 10:00:22 **11** to answer. The question I'm trying to answer is does
 10:00:25 **12** the Bair Hugger bring air, its -- does its air travel
 10:00:30 **13** to the surgical site and is Elghobashi correct.
 10:00:35 **14** Elghobashi reports that within 43 seconds the air gets
 10:00:38 **15** there. Okay. Now I didn't have that information of
 10:00:43 **16** 43 seconds when I wrote this, so I went extra, I went
 10:00:46 **17** 60 seconds.
 10:00:47 **18** But my answer is: Within 43 seconds are the
 10:00:51 **19** patterns of streamlines, A, close to the surgical
 10:00:55 **20** site; B, are they changing in a way that will bring
 10:00:59 **21** them to the surgical site. And the answer to both of
 10:01:02 **22** those were no -- was -- is no.
 10:01:05 **23** **Q.** Now when you say "the air from the Bair
 10:01:10 **24** Hugger," are you talking about the exhaust air out of
 10:01:13 **25** the blanket?

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10:01:14 **1** **A.** In my case I actually modeled two different
 10:01:18 **2** airstreams, because there's some conflicting
 10:01:22 **3** accusations about whether it's air from the Bair
 10:01:25 **4** Hugger or whether it's Bair Hugger heat might take air
 10:01:30 **5** from beneath the table and bring that to the surgical
 10:01:33 **6** site. So those are two conflicting propositions. I
 10:01:38 **7** investigated both. I looked at air from beneath the
 10:01:43 **8** surgical table and air from the Bair Hugger itself.
 10:01:46 **9** **Q.** Okay. So the two scenarios you looked at
 10:01:49 **10** was from air from the Bair Hugger, and that would be
 10:01:53 **11** the exhaust air from the Bair Hugger; correct?
 10:01:54 **12** **A.** That is correct.
 10:01:55 **13** **Q.** Okay. And the second one you looked at was
 10:02:04 **14** from just air underneath the operating room table.
 10:02:06 **15** **A.** That is correct.
 10:02:07 **16** **Q.** Any specific point underneath the operating
 10:02:09 **17** room table?
 10:02:10 **18** **A.** I recall it was a -- a region, and I think
 10:02:14 **19** it was a meter in diameter but I can't recall the
 10:02:17 **20** actual si -- I can't recall the specific size, but it
 10:02:21 **21** was a -- it was a zone underneath the table.
 10:02:23 **22** **Q.** Was it underneath the head or the -- or
 10:02:25 **23** the --
 10:02:25 **24** **A.** It was near the center --
 10:02:26 **25** Well it would have -- couldn't have just

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10:02:28 **1** been underneath the head because it was larger than
 10:02:31 **2** the head. I don't recall exactly where that sphere
 10:02:34 **3** was, but it was a large sphere.
 10:02:36 **4** **Q.** Okay. So you have the operating room table
 10:02:38 **5** and you have the post or the stand that raises it from
 10:02:42 **6** the floor; correct?
 10:02:44 **7** **A.** Correct.
 10:02:44 **8** **Q.** Okay. Was it towards -- that zone towards
 10:02:50 **9** the head, from that point towards the head of -- of
 10:02:53 **10** the patient, or from that post to behind to the feet
 10:02:59 **11** of the patient?
 10:03:00 **12** **A.** I don't recall it being predisposed either
 10:03:02 **13** toward the head or the feet. It was probably more
 10:03:05 **14** centrally located, but I just don't recall the exact
 10:03:08 **15** location sitting here.
 10:03:09 **16** **Q.** Was the zone that you created, was it a zone
 10:03:15 **17** in the -- if the Y axis is height, was it within the Y
 10:03:20 **18** axis or was it within the X and Z axis?
 10:03:23 **19** **A.** It would have been all three.
 10:03:24 **20** **Q.** All three.
 10:03:25 **21** **A.** It would have been a three-dimensional zone.
 10:03:28 **22** **Q.** Three-dimensional zone.
 10:03:29 **23** And would that zone be somewhere on your
 10:03:36 **24** 2540 TRN file?
 10:03:39 **25** **A.** I don't know.

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10:03:50 **1** **Q.** And when you create these streamlines, how
 10:03:52 **2** do you create them in ANSYS? Which is the software
 10:03:58 **3** you used; correct?
 10:03:59 **4** **A.** Correct.
 10:04:02 **5** You create them by identifying a starting
 10:04:05 **6** location, where they begin, and a track duration.
 10:04:19 **7** **Q.** A starting location and a track duration.
 10:04:21 **8** **A.** Right. So how long do you track them.
 10:04:23 **9** **Q.** And in this case that's 60 seconds.
 10:04:25 **10** **A.** Yes.
 10:04:33 **11** **Q.** So would it be fair and accurate to state
 10:04:37 **12** that you only looked at the first 60 seconds of a
 10:04:46 **13** streamline; correct?
 10:04:51 **14** **A.** Well beyond -- I mean -- These --
 10:04:55 **15** These software programs are not indefinitely
 10:04:58 **16** predictive, okay. So you can only use them to predict
 10:05:03 **17** flow for a certain time period. I used 60 seconds
 10:05:07 **18** because that was what was opined by Elghobashi as the
 10:05:12 **19** time it took.
 10:05:13 **20** Now it turns out he revised that expectation
 10:05:16 **21** and I believe his new time period is 43 seconds. So
 10:05:21 **22** if I were to do it again I would track the flow for 43
 10:05:25 **23** seconds.
 10:05:26 **24** **Q.** So the purpose of your report was to prove
 10:05:31 **25** that Dr. Elghobashi was incorrect.

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10:05:34 **1** A. No.
 10:05:35 **2** MR. GOSS: Object to form.
 10:05:36 **3** A. I disagree.
 10:05:37 **4** Q. Then why not use two minutes, or three
 10:05:39 **5** minutes, or some other time?
 10:05:44 **6** A. Because C -- CFD is like weather prediction.
 10:05:50 **7** It's valid for a certain time period, but you can't
 10:05:53 **8** extend it indefinitely. Weather predictions are good
 10:06:00 **9** for about seven days, but weather predictions are not
 10:06:04 **10** good a year from now.
 10:06:05 **11** So you cannot project a result beyond the
 10:06:10 **12** capacity of the solution, and that's why I wouldn't
 10:06:16 **13** want to use longer time periods.
 10:06:20 **14** What I wanted to do is say, well here's an
 10:06:22 **15** idea that these particles get here in 60 seconds. Is
 10:06:28 **16** that true or not? My purpose was not to show he was
 10:06:31 **17** incorrect, my purpose was to see if he was correct.
 10:06:38 **18** Q. And it's your opinion that Dr. Elghobashi
 10:06:41 **19** was not correct.
 10:06:42 **20** A. I --
 10:06:43 **21** It's my opinion he is incorrect.
 10:06:45 **22** Q. Okay. So would it be fair to say that when
 10:07:04 **23** you performed your CFD analysis that your null
 10:07:08 **24** hypothesis was that Dr. Elghobashi was correct?
 10:07:14 **25** MR. GOSS: Are we saying for the 2540 --
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10:07:16 **1** MR. ASSAAD: Yes.
 10:07:17 **2** MR. GOSS: -- 505?
 10:07:21 **3** A. I was agnostic about whether he is correct
 10:07:24 **4** or incorrect. Now --
 10:07:27 **5** Q. What was your --
 10:07:29 **6** Sorry. Go ahead.
 10:07:29 **7** A. That was it.
 10:07:30 **8** Q. I was going to ask you what was your null
 10:07:32 **9** hypothesis, if you had one?
 10:07:34 **10** A. I did not have one.
 10:07:36 **11** Q. Okay. Now it is my understanding that the
 10:07:56 **12** 2540.TRN file was created prior to your first
 10:08:01 **13** deposition; correct?
 10:08:03 **14** A. That is correct.
 10:08:04 **15** Q. Okay. When you created your report in this
 10:08:07 **16** case did you go back to the file and do more -- create
 10:08:14 **17** more streamlines?
 10:08:16 **18** A. I went back to the file and created more
 10:08:18 **19** streamlines, and I don't know if it was before or
 10:08:20 **20** after this report.
 10:08:23 **21** Q. Okay. You do agree that when Dr. Elghobashi
 10:08:27 **22** came up with his report that said that the particles
 10:08:30 **23** will get there between 25 to 60 seconds, that was
 10:08:34 **24** after you created your 2540.TRN file.
 10:08:39 **25** A. That is correct.
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10:08:39 **1** (Ms. Zimmerman joined the proceedings.)
 10:08:40 **2** Q. Okay. So did you use the 60 seconds of
 10:08:42 **3** streamlines prior to Dr. Elghobashi's report, or after
 10:08:50 **4** Dr. Elghobashi's report in this case?
 10:08:54 **5** A. I don't re --
 10:08:55 **6** I don't know for sure. It may well have
 10:08:57 **7** been after. I don't -- I don't recall when.
 10:09:10 **8** Q. Okay. Looking at Exhibit 1, Figure 3, page
 10:09:36 **9** 4. We see three sets of streamlines there; correct?
 10:09:45 **10** A. Correct.
 10:09:46 **11** Q. Do you know the time that each picture is?
 10:09:55 **12** A. So this is one of those times, you gave me
 10:09:58 **13** instructions initially to let you know if I was
 10:10:01 **14** estimating.
 10:10:02 **15** Q. Yes.
 10:10:02 **16** A. I don't know for sure. I wouldn't say that
 10:10:05 **17** I know with a reasonable degree of engineering
 10:10:08 **18** certainty, but I think they were one -- No, I don't --
 10:10:12 **19** I don't know for sure, but they were -- I don't know.
 10:10:15 **20** Q. Okay. The last one on the bottom, would
 10:10:17 **21** that be the 60-second streamline?
 10:10:20 **22** A. No.
 10:10:22 **23** Q. Okay. Would it be less than 60 seconds?
 10:10:24 **24** A. Yes.
 10:10:31 **25** Q. Are there any diagrams or figures that show
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10:10:37 **1** the streamlines at 60 seconds -- that ran for 60
 10:10:40 **2** seconds, in your report?
 10:10:45 **3** A. I don't believe they are in my report.
 10:10:46 **4** Q. Okay.
 10:10:47 **5** A. We have Figures 6 and 8, and I don't recall
 10:10:49 **6** how long those streamlines are tracked.
 10:11:36 **7** Q. With respect to the determination of
 10:11:39 **8** quasi-steady, when you talk about a change in
 10:11:44 **9** streamlines are you comparing the streamlines between
 10:11:58 **10** different TRN files?
 10:12:06 **11** A. Yes.
 10:12:08 **12** Q. And you did that in this case.
 10:12:09 **13** A. Yes.
 10:12:14 **14** Q. And it's your opinion that none of the
 10:12:17 **15** streamlines ended up over the operating room table;
 10:12:25 **16** correct?
 10:12:30 **17** A. It is my opinion --
 10:12:33 **18** So I -- I tracked the streamlines for 60
 10:12:35 **19** seconds, because that was the longest period that
 10:12:39 **20** Elghobashi stated in his supplemental report, and I
 10:12:43 **21** found no evidence that any -- at any time period any
 10:12:49 **22** of those streamlines would be at the surgical site.
 10:12:54 **23** Q. So it's your opinion that the Bair Hugger
 10:12:58 **24** does not change airflow to cause any streamlines from
 10:13:04 **25** the exhaust of the Bair Hugger or underneath the
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10:13:08 **1** operating room table to go over the surgical site.
 10:13:12 **2** MR. GOSS: Object to form.
 10:13:15 **3** MR. ASSAAD: Basis?
 10:13:16 **4** MR. GOSS: I think the basis is that
 10:13:19 **5** mischaracterizes his testimony, because he gave a
 10:13:22 **6** timeframe.
 10:13:24 **7** **Q.** In 60 seconds.
 10:13:26 **8** MR. GOSS: There you go.
 10:13:26 **9** **A.** Yes.
 10:13:28 **10** Actually could we read the question back?
 10:13:30 **11** Just -- I want to make sure what I said "yes" to.
 10:13:32 **12** **Q.** Let me break it apart.
 10:13:41 **13** It is your opinion that the Bair Hugger does
 10:13:44 **14** not change airflow to cause any streamlines from the
 10:13:48 **15** exhaust of the Bair Hugger to go over the surgical
 10:13:53 **16** site within 60 seconds.
 10:13:55 **17** **A.** Correct.
 10:13:56 **18** **Q.** It is also your opinion that the Bair Hugger
 10:13:59 **19** does not change airflow to cause any streamlines from
 10:14:04 **20** underneath the operating room table to go over the
 10:14:07 **21** surgical site within 60 seconds.
 10:14:08 **22** **A.** Correct.
 10:14:17 **23** **Q.** Now you mentioned earlier with respect to
 10:14:22 **24** the predictability of CFD is only for a certain period
 10:14:27 **25** of time.

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10:14:28 **1** **A.** Yes.
 10:14:28 **2** **Q.** And you mentioned, for example, weather
 10:14:31 **3** predictions are only good for seven days.
 10:14:34 **4** **A.** Yes.
 10:14:40 **5** **Q.** In this case, in this CFD, how long can you
 10:14:41 **6** run the CFD before the result -- before the -- before
 10:14:45 **7** it's no longer predictable?
 10:14:49 **8** **A.** I don't know the answer to that, and I don't
 10:14:51 **9** think anyone does.
 10:14:51 **10** **Q.** Okay.
 10:14:52 **11** **A.** In fact no one knows the answer to that.
 10:14:55 **12** **Q.** Okay. So you're not saying that if you ran
 10:14:57 **13** it for a hundred seconds of simulation time that the
 10:15:17 **14** results would be incorrect, or non-predictable.
 10:15:24 **15** **A.** You used two negatives in that. Could you
 10:15:27 **16** rephrase that question?
 10:15:28 **17** **Q.** You're right, it was a bad question.
 10:15:30 **18** Your 2540 TRN file was a simulation time of
 10:15:40 **19** 5.2 seconds; correct?
 10:15:43 **20** **A.** I don't believe that's correct.
 10:15:44 **21** **Q.** How much --
 10:15:45 **22** What simulation time do you think it is?
 10:15:47 **23** **A.** I think it was 5.07.
 10:15:49 **24** **Q.** You are right, it was 5.07. Correct.
 10:15:53 **25** **A.** Were you trying to trick me?

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10:15:54 **1** **Q.** No.
 10:15:55 **2** (Laughter.)
 10:16:06 **3** **Q.** And you believe within -- at 5.07 seconds
 10:16:10 **4** that the CFD simulation is predictive of what would
 10:16:16 **5** happen.
 10:16:17 **6** **A.** The TRN file which I provided, which is
 10:16:21 **7** associated with 5.0 seconds of calculation time as
 10:16:24 **8** we've talked about, I believe is predictive, is able
 10:16:27 **9** to predict the pattern of flow through 60 seconds.
 10:16:30 **10** **Q.** Okay. What about if you ran the CFD for 10
 10:16:34 **11** seconds of simulation time, would it also -- would it
 10:16:37 **12** also predict the pattern of flow of 60 seconds of
 10:16:41 **13** streamline time?
 10:16:42 **14** **A.** I would expect it would.
 10:16:43 **15** **Q.** What about 50 seconds?
 10:16:47 **16** **A.** I expect it would.
 10:16:52 **17** **Q.** What about 75 seconds?
 10:16:55 **18** **A.** I expect it would.
 10:16:57 **19** **Q.** Well what would be the upper limit then?
 10:17:00 **20** **A.** Of simulation time?
 10:17:01 **21** **Q.** Yeah. To pre --
 10:17:02 **22** **A.** You could run it forever.
 10:17:04 **23** **Q.** But you said after you run it for such a
 10:17:06 **24** long time it's no longer predictive.
 10:17:06 **25** **A.** Oh --

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10:17:08 **1** **Q.** Or did I misunderstand you?
 10:17:10 **2** **A.** Yeah, you misunderstand. You're confusing
 10:17:13 **3** two different times. You're confusing simulation time
 10:17:15 **4** with time on the streamline.
 10:17:16 **5** **Q.** Okay. Okay. So when you're talking about
 10:17:20 **6** whether or not it can predict airflow, you're talking
 10:17:22 **7** about the streamlines.
 10:17:24 **8** **A.** That is correct.
 10:17:25 **9** **Q.** Not about simulation time.
 10:17:27 **10** **A.** Well I'm using both. We're using both times
 10:17:29 **11** in our -- in our conversation here, so we need to be
 10:17:32 **12** clear about which time we're actually talking about.
 10:17:34 **13** **Q.** Yes.
 10:17:35 **14** And I'm talking about simulation time, how
 10:17:37 **15** -- how long you run the CFD.
 10:17:41 **16** You're not saying that the longer you run it
 10:17:43 **17** there's a certain limit where it's no longer
 10:17:46 **18** predictive.
 10:17:47 **19** **A.** I am not saying that.
 10:17:49 **20** **Q.** Okay. Computational fluid dynamics is a
 10:18:26 **21** method that can be used to predict airflow in an
 10:18:30 **22** operating room; correct?
 10:18:32 **23** **A.** Yes.
 10:18:34 **24** **Q.** And actually you were originally retained by
 10:18:37 **25** 3M back in 2015 to predict the airflow in an operating

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10:18:45 **1** room with the Bair Hugger in it; correct?

10:18:47 **2** **A.** Yes.

10:19:30 **3** **Q.** When you were looking at the streamlines to

10:19:31 **4** determine quasi-steady state, did you see any changes

10:19:39 **5** in the streamlines between TRN files?

10:19:41 **6** **A.** Yes.

10:19:44 **7** **Q.** Did you calculate or determine the delta or

10:19:48 **8** the change in streamlines between the different TRN

10:19:51 **9** files?

10:19:52 **10** **A.** That's a poorly-posed question because

10:19:55 **11** you're asking me "change," you haven't told me the

10:19:59 **12** change in what.

10:20:00 **13** Are you talking about position, velocity,

10:20:01 **14** time, et cetera?

10:20:02 **15** **Q.** Any change. Change in velocity,

10:20:05 **16** temperature, vectors.

10:20:09 **17** **A.** There were slight changes over time. And in

10:20:14 **18** fact that's always the case with a simulation like

10:20:17 **19** this. That was the case with Elghobashi's simulation

10:20:20 **20** as well.

10:20:21 **21** **Q.** I understand that you want to compare your

10:20:23 **22** simulation to Dr. Elghobashi's simulation, but I'm

10:20:26 **23** just...

10:20:29 **24** I want you to answer my questions of how you

10:20:31 **25** support your opinions and your analysis based on

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10:20:39 **1** generally accepted engineering methodology and what

10:20:41 **2** you did.

10:20:42 **3** **A.** I understand that.

10:20:46 **4** **Q.** When you say "slight change," a slight

10:20:48 **5** change in what with respect to the streamlines?

10:20:50 **6** **A.** What I looked at is change of the position

10:20:52 **7** of the streamlines from one calculation to the next.

10:20:59 **8** **Q.** And when you say "position," you're talking

10:21:01 **9** about the actual coordinates.

10:21:03 **10** **A.** Yes.

10:21:13 **11** **Q.** And did you look at the change in

10:21:15 **12** temperature?

10:21:18 **13** **A.** I did not use the change in temperature to

10:21:22 **14** mark quasi-steady, I used the flow patterns

10:21:26 **15** themselves.

10:21:26 **16** **Q.** Was there a change in temperature between

10:21:28 **17** the TRN files in the operating room?

10:21:31 **18** **A.** There certainly would be a change in

10:21:33 **19** temperature. I don't -- I didn't quantify it because

10:21:37 **20** it wasn't important. I looked at the change in

10:21:41 **21** trajectory of the flow.

10:21:47 **22** **Q.** Was there a change in turbulence intensity

10:21:50 **23** between the different TRN files?

10:21:52 **24** **A.** There certainly would be a change in

10:21:54 **25** turbulence intensity and turbulence level, but again I

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10:21:57 **1** used the trajectory of the flow.

10:22:04 **2** **Q.** Was there an increase in turbulence over

10:22:07 **3** time?

10:22:07 **4** **A.** I don't know if there was an increase or

10:22:09 **5** decrease in turbulence intensity over time.

10:22:12 **6** **Q.** Was there an increase in temperature over

10:22:14 **7** time in the operating room?

10:22:15 **8** **A.** I don't know if there was an increase in

10:22:16 **9** temperature or a decrease in temperature over time in

10:22:21 **10** the operating room.

10:22:27 **11** **Q.** But that's something that anyone in the

10:22:30 **12** field that has access to ANSYS could determine based

10:22:34 **13** off of your TRN files; correct?

10:22:36 **14** **A.** Yes.

10:23:21 **15** **Q.** On the 505 model, at time zero -- Strike

10:23:27 **16** that.

10:23:28 **17** Did you run the 505 CFD model with the Bair

10:23:34 **18** Hugger off?

10:23:35 **19** **A.** No.

10:23:38 **20** **Q.** So sitting here today you do not know what

10:23:41 **21** the streamlines would look like with the Bair Hugger

10:23:44 **22** off of air coming from underneath the table.

10:23:49 **23** **A.** That is correct.

10:23:52 **24** **Q.** And since the Bair Hugger's off, there would

10:23:54 **25** be no exhaust to the streamlines from the Bair Hugger

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10:23:56 **1** itself.

10:23:57 **2** **A.** That would be correct.

10:23:58 **3** **Q.** Okay. At time zero, when you turned the

10:24:10 **4** Bair Hugger on, did you have anything in your initial

10:24:26 **5** conditions that would have estimated the flow pattern

10:24:33 **6** of the exhaust from the Bair Hugger blanket?

10:24:37 **7** **A.** Yes.

10:24:38 **8** **Q.** What was that?

10:24:39 **9** **A.** I would have either used a initial condition

10:24:43 **10** which was a steady-state calculation, or I may have

10:24:46 **11** used an initial condition from the 750. I don't

10:24:50 **12** recall which initial condition I used.

10:24:52 **13** **Q.** Between the 505 calculation, CFD

10:24:56 **14** calculation, and the 750, what changes were made?

10:25:00 **15** **A.** The flow rate from the Bair Hugger.

10:25:03 **16** **Q.** Anything else?

10:25:04 **17** **A.** No other changes.

10:25:06 **18** **Q.** Okay. Geometry was the same; correct?

10:25:08 **19** **A.** Geometry was the same.

10:25:13 **20** **Q.** The temperature coming at the diffusers, the

10:25:17 **21** inlet temperature at the diffusers were the same;

10:25:19 **22** correct?

10:25:20 **23** **A.** Yes.

10:25:20 **24** **Q.** You used 41 degrees Celsius as the exit

10:25:24 **25** temperature of the Bair Hugger exhaust; correct?

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10:25:26 **1** A. Yes.

10:25:39 **2** Q. Why was the cost to 3M more for the 505 CFD

10:25:47 **3** than the 750 if the only thing that you had to change

10:25:52 **4** was the -- the flow rate out of the Bair Hugger

10:25:56 **5** blanket?

10:26:00 **6** A. Well the fact is I think that I

10:26:03 **7** significantly undercharged for the first study. It

10:26:07 **8** took a lot of time. And the cost for the second study

10:26:11 **9** was a more accurate representation of the work

10:26:14 **10** required.

10:26:20 **11** Q. Did anyone assist you in the 505?

10:26:24 **12** A. No one assisted me in the 505.

10:26:28 **13** Q. So Mr. Plourde --

10:26:31 **14** Is it Plourde?

10:26:33 **15** A. Plourde.

10:26:34 **16** Q. -- Plourde or Ms. Vallez did not assist you?

10:26:38 **17** A. That is correct.

10:26:48 **18** Q. So it's your opinion that you undercharged

10:26:50 **19** 3M for the 750 model?

10:26:56 **20** A. It's my opinion --

10:26:58 **21** Yes, that is my opinion.

10:27:00 **22** Q. Okay. And so you decided to overcharge them

10:27:02 **23** for the 505?

10:27:03 **24** MR. GOSS: Object to form.

10:27:04 **25** A. I didn't say that.

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10:27:06 **1** Q. I'm asking you that.

10:27:07 **2** A. I did not --

10:27:08 **3** MR. GOSS: Object to form.

10:27:09 **4** A. I did not overcharge them for the 505.

10:27:11 **5** Q. Okay.

10:27:11 **6** A. And I never said that I overcharged them.

10:27:14 **7** Q. How long did it take to run the 505 model?

10:27:18 **8** A. I don't recall the time it took.

10:28:05 **9** (Abraham Exhibit 2 marked for

10:28:05 **10** identification.)

10:28:05 **11** BY MR. ASSAAD:

10:28:07 **12** Q. This is an invoice from you to 3M

10:28:13 **13** Corporation for \$14,000 to do a numerical simulation

10:28:20 **14** of airflow within an OR during use of a Bair Hugger

10:28:23 **15** 505 blower blanket; is that correct?

10:28:25 **16** A. Yes.

10:28:26 **17** Q. And it's dated April 7th, 2017; correct?

10:28:30 **18** A. Correct.

10:28:31 **19** Q. Did you submit this invoice before or after

10:28:34 **20** you started the project?

10:28:39 **21** A. Boy, I'm pretty sure it was after. I mean

10:28:43 **22** my -- my typical practice is to submit an invoice

10:28:45 **23** after.

10:28:46 **24** Q. Okay. So you completed the modeling, the

10:28:51 **25** numerical simulation for the 505 by April 7th, 2017.

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10:28:54 **1** A. That is what I recall.

10:28:56 **2** Q. Okay. And do you know when you began the

10:29:06 **3** project?

10:29:08 **4** A. I don't recall.

10:29:09 **5** Q. Do you know if it was in 2016?

10:29:11 **6** A. I don't believe it was 2016.

10:29:13 **7** Q. Okay. So your best guess would be somewhere

10:29:18 **8** between January 1st, 2017 and April 7th, 2017.

10:29:26 **9** A. Yes.

10:29:48 **10** Q. Did the time it take to run the 505 model,

10:29:52 **11** was that longer or shorter than the run on the 750?

10:29:59 **12** A. I don't recall.

10:30:04 **13** Q. Is there anything you changed in the model,

10:30:10 **14** such as the equations or the assumptions, between the

10:30:12 **15** 505 and the 750?

10:30:16 **16** A. I think the only thing I changed was the

10:30:19 **17** flow rate out the Bair Hugger.

10:30:25 **18** Q. And you still used the Boussinesq

10:30:30 **19** approximation.

10:30:31 **20** A. Yes.

10:30:32 **21** Q. And the model for the 505 is a Large-Eddy

10:30:36 **22** Simulation; correct?

10:30:37 **23** A. Yes.

10:30:37 **24** Q. And you ran it as a Large-Eddy Simulation

10:30:40 **25** from time zero to 5.07 seconds?

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10:30:42 **1** A. Yes.

10:30:43 **2** Q. At no time between the beginning of the run

10:30:47 **3** and the 2540 TRN file was RANS ever used.

10:30:54 **4** A. No.

10:30:57 **5** MR. GOSS: I want to make sure we get that

10:30:58 **6** one. I think there were two negatives. Well...

10:31:09 **7** A. RANS was not used.

10:31:12 **8** MR. GOSS: Thank you.

10:31:14 **9** Q. Was RANS used at any time with respect to

10:31:17 **10** your work on the 505?

10:31:19 **11** A. It may have been used for the initial

10:31:21 **12** conditions, although I don't recall.

10:32:03 **13** Q. You ran the model further than 5.02 seconds

10:32:10 **14** at a later time; correct?

10:32:12 **15** MR. GOSS: Object to form.

10:32:15 **16** Q. 07 seconds. My fault.

10:32:17 **17** A. Yes.

10:32:17 **18** Q. How far --

10:32:18 **19** How long did you run the model for?

10:32:20 **20** A. I don't recall.

10:32:20 **21** Q. Did you produce all the files that you

10:32:24 **22** created with respect to your 505 work?

10:32:30 **23** A. Yes.

10:32:38 **24** Q. Did you destroy any files or delete any

10:32:40 **25** files?

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10:32:40 **1** A. No.

10:32:42 **2** Q. So I take it that you produced a TRN file

10:32:46 **3** for every 10 time steps; correct?

10:32:50 **4** A. That is what I recall.

10:32:51 **5** Q. Okay. So there's a TRN file for time step

10:32:56 **6** 10; correct?

10:32:59 **7** A. Following the 2540.

10:33:02 **8** Q. What about before the 2540?

10:33:04 **9** A. As I recall, I produced two time steps

10:33:07 **10** before the 2540.

10:33:10 **11** Q. I understand what you produced, but you set

10:33:12 **12** it up that when you ran the 505 that it would create a

10:33:20 **13** TRN file for every time step; correct? Every ten time

10:33:23 **14** steps.

10:33:23 **15** A. That is correct.

10:33:24 **16** Q. Okay. So when you ran the 505, it created

10:33:27 **17** time steps for 10, 20, 30, 40, 50 and so on; correct?

10:33:32 **18** A. Yes.

10:33:32 **19** Q. Okay. And where are those files now?

10:33:35 **20** A. Those files are no longer -- I no longer

10:33:38 **21** have them. What I produced, the TRN file is the

10:33:41 **22** master file, and from that you can recreate the

10:33:44 **23** results. It's our practice in simu --

10:33:47 **24** These files are large, and I think

10:33:50 **25** Elghobashi testified to this. Sometimes they're so

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10:33:52 **1** large you can't send them. So it's our practice to

10:33:56 **2** keep the essential files, the master file, and that's

10:33:59 **3** what I did.

10:34:00 **4** Q. And which is the master file?

10:34:01 **5** A. 2540.

10:34:02 **6** Q. Why is that the master file?

10:34:04 **7** A. Because it is a file that shows the

10:34:06 **8** quasi-steady results.

10:34:08 **9** Q. Are you saying that 2530 does not show

10:34:12 **10** quasi-steady results?

10:34:13 **11** A. No. I'm not saying that.

10:34:15 **12** Q. Okay. Did all the TRN files show

10:34:20 **13** quasi-steady results?

10:34:22 **14** A. I ran the results long enough until

10:34:24 **15** quasi-steady state was achieved, and then I used a

10:34:28 **16** representative file from that set, and I call that the

10:34:31 **17** master file, and that's what was produced.

10:34:33 **18** Q. Okay. And the other files you deleted

10:34:35 **19** because they were large.

10:34:36 **20** A. No, --

10:34:37 **21** MR. GOSS: Object to form.

10:34:38 **22** A. -- I didn't.

10:34:39 **23** They are large, that's a fact. They are

10:34:43 **24** difficult to send. In fact I think that the

10:34:47 **25** plaintiffs' experts has not sent any files because he

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10:34:50 **1** said they were too large. I produced a representative

10:34:53 **2** file so that anyone could reproduce my work. A master

10:34:56 **3** file so anyone could reproduce my work.

10:34:58 **4** Now that master file has all the information

10:35:01 **5** that's needed. It has the geometry, it has the mesh,

10:35:05 **6** it has the boundary conditions, and it has the

10:35:07 **7** results. So I produced a master file which can be

10:35:11 **8** used to reproduce my work.

10:35:13 **9** Q. And when you say someone could run it, they

10:35:15 **10** can run it forward?

10:35:16 **11** A. Yes.

10:35:16 **12** Q. For how long?

10:35:17 **13** A. As long as they want.

10:35:20 **14** Q. So they could run it forward for an hour of

10:35:22 **15** simulation time?

10:35:23 **16** A. Yes.

10:35:24 **17** MR. GOSS: Object to form.

10:35:25 **18** Q. And would that be accurate, would it --

10:35:27 **19** would it be predictive of what would happen after 60

10:35:30 **20** minutes of simulation time?

10:35:31 **21** A. It may be.

10:35:43 **22** Q. So what did you do with the other files

10:35:47 **23** pri -- like -- that are before the 2540 file?

10:35:52 **24** A. Two were maintained, and I believe those

10:35:54 **25** were provided. And the other files I did not

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10:35:57 **1** maintain.

10:35:59 **2** Q. Which means you deleted them.

10:36:02 **3** MR. GOSS: Object to form.

10:36:03 **4** A. They were deleted, but you're using the word

10:36:08 **5** "delete" to imply that I'm withholding evidence.

10:36:11 **6** Q. I am not, sir.

10:36:12 **7** A. Well I --

10:36:14 **8** Q. I'm just asking were they physically

10:36:16 **9** deleted?

10:36:17 **10** A. What was retained, and what is the practice

10:36:19 **11** in our field is to retain the master file. I retained

10:36:23 **12** that master file, in fact I retained extra files that

10:36:28 **13** aren't even needed, and those were provided.

10:36:30 **14** It is not practice to retain every single

10:36:33 **15** file because they are very large and it's almost

10:36:37 **16** impossible to send them.

10:36:46 **17** Q. The files were on a computer; correct?

10:36:49 **18** A. Yes.

10:36:49 **19** Q. On your 16 core computer that you used for

10:36:51 **20** the simulation; correct?

10:36:52 **21** A. Yes.

10:36:53 **22** Q. And you did not retain those files; correct?

10:36:58 **23** A. Again, I retained any essential file that

10:37:02 **24** was needed to assess my work. I didn't retain every

10:37:05 **25** single file, but I retained the file that has the

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10:37:09 **1** mesh, the geometry, the boundary conditions, and the
 10:37:13 **2** results. That's all that's needed. I retained that
 10:37:16 **3** file, and in addition I retained other files, which
 10:37:19 **4** are an overabundance of files.
 10:37:27 **5** **Q.** And I'll ask you this again. And you
 10:37:30 **6** deleted the other files.
 10:37:32 **7** **A.** I deleted any unimportant or unessential
 10:37:35 **8** files.
 10:37:37 **9** **Q.** Okay. And when you say nonessential or
 10:37:42 **10** unimportant, that's nonessential and unimportant to
 10:37:45 **11** you.
 10:37:47 **12** **A.** No. It's not essential and unimportant to
 10:37:52 **13** answering the question that I wanted to answer. And
 10:37:56 **14** that question is: Does air from the Bair Hugger get
 10:38:03 **15** near the surgical site within 43 seconds. I retained
 10:38:07 **16** every file that is needed to answer that question.
 10:38:18 **17** **Q.** The initial file would contain the initial
 10:38:22 **18** conditions; correct?
 10:38:27 **19** **A.** I don't know what you mean by "initial
 10:38:28 **20** file."
 10:38:29 **21** **Q.** Well you created --
 10:38:31 **22** You had initial conditions; correct?
 10:38:33 **23** **A.** Correct.
 10:38:33 **24** **Q.** And you mentioned earlier that you didn't
 10:38:35 **25** know how they were created, whether or not you created
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10:38:38 **1** it with a RANS model or you did calculations; correct?
 10:38:41 **2** **A.** What I said earlier in this deposition was I
 10:38:43 **3** either used a RANS or I used my result from the prior
 10:38:47 **4** Bair Hugger.
 10:38:49 **5** **Q.** Okay.
 10:38:49 **6** **A.** Now it turns out the initial conditions are
 10:38:52 **7** not that important. You can get the same result if
 10:38:55 **8** you use different initial conditions.
 10:39:09 **9** **Q.** Well if I put the initial conditions and set
 10:39:10 **10** the temperature of the room at -- for the air space in
 10:39:15 **11** the room at 90 degrees Celsius, it would take awhile
 10:39:22 **12** for the room to come to quasi-steady state with
 10:39:26 **13** respect to temperature; correct?
 10:39:27 **14** **MR. GOSS:** I wouldn't want to be in that
 10:39:29 **15** room.
 10:39:29 **16** **MR. ASSAAD:** I understand that.
 10:39:30 **17** **A.** It may.
 10:39:31 **18** **Q.** Okay. So the initial conditions are
 10:39:34 **19** important with respect to the change between 5.07
 10:39:42 **20** seconds and what was the initial condition; correct?
 10:39:46 **21** **A.** No. You see, what is important is that you
 10:39:52 **22** reach quasi-steady state, and whatever your initial
 10:39:55 **23** conditions are don't matter.
 10:40:03 **24** **Q.** So it's your engineering opinion that as
 10:40:07 **25** long as you reach quasi-steady state, initial
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10:40:11 **1** conditions for a computation fluid dynamics model is
 10:40:15 **2** irrelevant. Is that what I'm understanding?
 10:40:19 **3** **A.** I'm going to answer it. If your initial
 10:40:22 **4** conditions are very far off the mark, your calculation
 10:40:27 **5** will do something called diverge. That means it will
 10:40:32 **6** not converge to any result that's meaningful.
 10:40:35 **7** Provided your initial conditions are
 10:40:37 **8** sufficiently accurate, your results will converge to a
 10:40:42 **9** quasi-steady result and that convergence will be imma
 10:40:49 **10** -- will be independent of the actual initial
 10:40:51 **11** conditions.
 10:40:53 **12** **Q.** So my understanding is if your initial
 10:40:59 **13** conditions are way off, for lack of a better term, it
 10:41:05 **14** might cause the analysis to diverge and you won't get
 10:41:10 **15** a solution.
 10:41:12 **16** **A.** That is correct.
 10:41:13 **17** **Q.** Okay. Or it might cause an error in the
 10:41:15 **18** solution and it won't be able to solve; correct?
 10:41:19 **19** **A.** That is correct.
 10:41:26 **20** **Q.** If you ran the CFD forward -- your CFD
 10:41:33 **21** forward, whether it's the 750 or the 505, do you
 10:41:36 **22** expect it to -- to continue to converge on data and
 10:41:38 **23** solve the problem?
 10:41:41 **24** **A.** I would expect that that would be the case.
 10:41:43 **25** **Q.** Okay. Because in some reading I've done, or
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10:41:54 **1** research, sometimes the CFD will be unable to solve a
 10:42:00 **2** problem because it either crashes or it diverges;
 10:42:05 **3** correct?
 10:42:06 **4** **A.** Right. And we've talked about that here.
 10:42:08 **5** **Q.** Just now.
 10:42:09 **6** **A.** We've talked about it diverging in solution.
 10:42:09 **7** **Q.** Okay.
 10:42:12 **8** **A.** I mentioned that explicitly.
 10:42:13 **9** **Q.** And when a -- and a solution diverges, what
 10:42:17 **10** does that tell you?
 10:42:18 **11** **A.** It can tell you --
 10:42:20 **12** It could diverge for a number of different
 10:42:22 **13** reasons. It could diverge because you have something
 10:42:25 **14** unphysical happening.
 10:42:34 **15** **Q.** Okay. What else?
 10:42:35 **16** **A.** It could diverge because one of your
 10:42:37 **17** elements is a negative volume element.
 10:42:46 **18** **Q.** Any other reason?
 10:42:51 **19** **A.** Those are the two reasons that are coming to
 10:42:53 **20** my mind now.
 10:42:54 **21** **Q.** Okay. And if something diverges, say, after
 10:43:04 **22** ten seconds of simulation time, what does that tell
 10:43:07 **23** you about the data before that ten seconds?
 10:43:13 **24** **A.** It --
 10:43:14 **25** I would have to look at the specifics. It
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10:43:15 **1** may not tell anything, but it may tell something. But
 10:43:18 **2** I'd have to look at the specifics of why it diverged.
 10:43:21 **3** **Q.** Okay. But it would be very concerning to
 10:43:26 **4** you if you ran a CFD and it diverged.
 10:43:31 **5** **MR. GOSS:** Object to form.
 10:43:34 **6** **A.** It depends on why it diverged. I don't -- I
 10:43:37 **7** wouldn't say a priori it would be very concerning. I
 10:43:43 **8** mean, I'd want to know why, but it may or may not
 10:43:46 **9** concern me.
 10:43:47 **10** **Q.** And to determine whether or not there is
 10:43:49 **11** divergence -- why the divergence occurred, you would
 10:43:53 **12** need the initial conditions; correct?
 10:43:54 **13** **A.** No.
 10:43:55 **14** **Q.** "No"?
 10:43:56 **15** **A.** No.
 10:43:57 **16** **Q.** What would you need?
 10:44:02 **17** **A.** So, for example, I gave two reasons why a
 10:44:07 **18** solution might be -- might diverge, and one was
 10:44:10 **19** unphysical boundary conditions or unphysical
 10:44:12 **20** conditions.
 10:44:13 **21** **Q.** What do you mean by "unphysical," by the
 10:44:15 **22** way?
 10:44:15 **23** **A.** Let's say --
 10:44:16 **24** Let's think about this room. Let's say that
 10:44:20 **25** we have ventilation flow coming in from the ceiling
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10:44:24 **1** and we set up a CFD model and we have no outflow. We
 10:44:29 **2** have no way for that air to leave. Over time, air is
 10:44:33 **3** going to be entering the room, it's going to be
 10:44:35 **4** filling up the room, the room is going to become
 10:44:37 **5** pressurized and it will continue on to infinity. That
 10:44:40 **6** would be an unphysical situation. We know that's not
 10:44:43 **7** true.
 10:44:43 **8** **Q.** Okay.
 10:44:43 **9** **A.** So there has to be some outlet to this room.
 10:44:46 **10** The outlet may be another vent, it may be underneath
 10:44:49 **11** the door, but that would allow the solution not to
 10:44:51 **12** diverge.
 10:44:52 **13** Another example, using this room again,
 10:44:56 **14** would be related to heat. We have things that are
 10:44:59 **15** generating heat. You are, I am, every -- every
 10:45:03 **16** electronic device is, and that heat has to go
 10:45:06 **17** somewhere. If in our simulation we don't provide an
 10:45:10 **18** -- an avenue for the heat to leave, the heat would
 10:45:12 **19** build up to infinity and that would be another
 10:45:15 **20** divergence. So it depends on the cause.
 10:45:26 **21** **Q.** And would those divergence cause the CFD
 10:45:31 **22** model to crash?
 10:45:33 **23** **A.** The two that I mentioned would.
 10:45:35 **24** **Q.** Okay. Any other divergence that could cause
 10:45:42 **25** a CFD model to crash?
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10:45:47 **1** **A.** I think if you took too large of a time
 10:45:49 **2** step, that may cause divergence -- that would cause
 10:45:52 **3** divergence.
 10:45:56 **4** **Q.** What about too small of a time step?
 10:45:59 **5** **A.** Oh boy. I've never heard of too small of a
 10:46:02 **6** time step causing divergence. I suppose if your time
 10:46:07 **7** step was so small that the results were within the
 10:46:14 **8** truncation error of the chip, that would -- that would
 10:46:16 **9** be an issue for me, that would be a question. I don't
 10:46:20 **10** know if that would cause divergence. I -- I would say
 10:46:22 **11** this. I've never heard of too small of a time step
 10:46:25 **12** causing divergence.
 10:46:28 **13** **Q.** Now the example I gave you before with the
 10:46:31 **14** initial conditions of a room being at like 90 degrees
 10:46:37 **15** Celsius, if divergence occurred because of that
 10:46:40 **16** scenario that was because I picked poor initial
 10:46:43 **17** conditions; correct?
 10:46:45 **18** **A.** If the init -- If the convergence --
 10:46:49 **19** If the divergence occurred because you set a
 10:46:52 **20** room at 90 degrees Celsius, then yes, your initial
 10:46:56 **21** conditions would have caused the divergence.
 10:46:58 **22** **Q.** So bad initial conditions could cause
 10:47:00 **23** divergence.
 10:47:01 **24** **A.** Yes. And I've already stated that.
 10:47:04 **25** **Q.** Now you've had your deposition taken before
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10:47:07 **1** in this -- in the multidistrict litigation; correct?
 10:47:11 **2** **A.** Yes.
 10:47:11 **3** **Q.** And you reviewed it and signed it for
 10:47:14 **4** corrections; correct?
 10:47:15 **5** **A.** Yes.
 10:47:16 **6** **Q.** And you made three changes; correct?
 10:47:18 **7** **A.** I don't recall the changes.
 10:47:21 **8** **Q.** Okay. You made some minor changes to the --
 10:47:23 **9** on your errata sheet.
 10:47:25 **10** Do you know what an errata sheet is?
 10:47:27 **11** **A.** Yes, I do.
 10:47:28 **12** **Q.** Okay. Did you review your deposition in
 10:47:29 **13** preparation of today's deposition?
 10:47:30 **14** **A.** Yes.
 10:47:30 **15** **Q.** And when was the last time you read your
 10:47:32 **16** deposition?
 10:47:33 **17** **A.** Within the last week.
 10:47:40 **18** **Q.** Did you meet with anyone with respect to
 10:47:42 **19** your -- in preparation of today's deposition?
 10:47:45 **20** **A.** Yes.
 10:47:46 **21** **Q.** With counsel?
 10:47:47 **22** **A.** Yes.
 10:47:48 **23** **Q.** And when did you meet?
 10:47:50 **24** **A.** I believe Monday and Tuesday of this week.
 10:47:52 **25** **Q.** And how long did you meet for?
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10:47:54 **1** A. Approximately two hours each time.
 10:47:56 **2** Q. Okay. Was anyone there besides counsel?
 10:48:01 **3** A. No.
 10:48:03 **4** Q. Prior to this week did you meet with them in
 10:48:07 **5** preparation of today's deposition?
 10:48:11 **6** A. I don't recall meeting with them prior to
 10:48:16 **7** this week in preparation for this deposition.
 10:48:18 **8** Q. Okay. Have you met with them since your
 10:48:29 **9** last depo?
 10:48:30 **10** A. Yes.
 10:48:31 **11** Q. How many times?
 10:48:33 **12** A. Oh, I don't know. I've met with them twice
 10:48:35 **13** this week, as I've mentioned.
 10:48:37 **14** Q. Besides this week.
 10:48:39 **15** A. I don't know how many times. Not very many,
 10:48:43 **16** because I've been out of the country for a lot of that
 10:48:46 **17** time period.
 10:48:47 **18** Q. For work?
 10:48:48 **19** A. For work and family travel.
 10:48:51 **20** Q. Okay. Would the times that you meet with
 10:49:00 **21** counsel in this case be on your invoices?
 10:49:06 **22** A. You know, I don't know. I tend to not
 10:49:09 **23** charge for a lot of things. I tend not to charge for
 10:49:12 **24** phone calls. I don't charge for travel, and short
 10:49:17 **25** meetings I tend not to charge. So it is possible a
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10:49:21 **1** meeting occurred that is not on the invoice.
 10:49:25 **2** Q. Have you met with anyone else besides
 10:49:27 **3** counsel regarding your CFD analysis in this case?
 10:49:31 **4** A. No.
 10:49:36 **5** Q. What is a short meeting?
 10:49:40 **6** A. Less than an hour maybe.
 10:49:42 **7** Q. Okay. Have you --
 10:49:46 **8** Have you had any discussions with regard to
 10:49:49 **9** your CFD analysis with any other professors?
 10:49:59 **10** A. No.
 10:50:21 **11** MR. ASSAAD: Let's take a break.
 10:50:23 **12** THE REPORTER: Off the record, please.
 10:50:24 **13** (Recess taken from 10:50 to 11:01 a.m.)
 11:01:07 **14** BY MR. ASSAAD:
 11:01:16 **15** Q. I want to back up a little bit just so I
 11:01:19 **16** understand what your opinions are with respect to the
 11:01:21 **17** streamlines and your quasi-steady determination.
 11:01:27 **18** You agree with me that between the different
 11:01:33 **19** TRN files that you've run there is a change in
 11:01:38 **20** temperature.
 11:01:39 **21** A. I did not agree to that. I said there may
 11:01:41 **22** be.
 11:01:42 **23** Q. So you don't know one way or the other.
 11:01:45 **24** A. There would be some cha --
 11:01:47 **25** There has to be some change in temperature,
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11:01:49 **1** but any change in temperature would be immaterial to
 11:01:52 **2** the conclusions of my report.
 11:01:54 **3** Q. Okay. But there would be some change in
 11:01:56 **4** temperature based on your education, training and
 11:01:58 **5** experience.
 11:01:58 **6** A. There have to be.
 11:01:59 **7** Q. Because you have a heat source in the room.
 11:02:04 **8** A. That's not the reason. It's because flow --
 11:02:09 **9** airflow in any space is going to have some change in
 11:02:12 **10** temperature.
 11:02:14 **11** Q. But all --
 11:02:14 **12** A. It may be small, it may be large, but there
 11:02:17 **13** would be -- have to be some non-zero change in
 11:02:19 **14** temperature.
 11:02:20 **15** Q. Okay. But also you have a Bair Hugger
 11:02:21 **16** device that's blowing warm air into the operating
 11:02:24 **17** room.
 11:02:25 **18** A. That is true, and there's also a ventilation
 11:02:28 **19** system that's blowing cold air.
 11:02:30 **20** Q. Okay. With respect to velocity, is there
 11:02:35 **21** going to be a change in the velocity at certain points
 11:02:40 **22** in the operating room between different TRN files?
 11:02:43 **23** A. There has to be some non-zero change in
 11:02:46 **24** velocity at certain points.
 11:02:48 **25** Q. Okay. And that would include the velocity
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11:02:52 **1** vectors; correct?
 11:02:54 **2** A. That would include the velocity vectors.
 11:02:56 **3** Q. Okay. And there would be a change in
 11:03:04 **4** turbulent intensity between the different TRN files;
 11:03:07 **5** correct?
 11:03:08 **6** A. With any unsteady flow there would have to
 11:03:10 **7** be a non-zero change in turbulence intensity.
 11:03:15 **8** Q. And you consider this an unsteady flow;
 11:03:17 **9** correct?
 11:03:17 **10** A. This is an unsteady flow.
 11:03:19 **11** Q. And that's why it's -- you're using LES.
 11:03:23 **12** A. No.
 11:03:24 **13** Q. That was a bad question. You are correct.
 11:03:25 **14** Because you can use RANS for an unsteady
 11:03:28 **15** flow; correct?
 11:03:29 **16** A. Correct.
 11:03:39 **17** Q. But when you run LES it is a transient flow;
 11:03:41 **18** correct?
 11:03:42 **19** A. That is correct.
 11:03:43 **20** Q. And "transient" means that it's changing
 11:03:45 **21** over time; correct?
 11:03:46 **22** A. That is correct.
 11:03:59 **23** Q. Now when you ran the streamlines on the 2540
 11:04:04 **24** TRN file you are looking at the results with respect
 11:04:19 **25** to velocity and its vectors just for that specific
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11:04:25 **1** time; correct?

11:04:27 **2** **A.** That is correct.

11:04:28 **3** **Q.** Okay. So for example, the 2540 TRN file you

11:04:44 **4** are basically freezing the model and looking at the

11:04:46 **5** velocity vectors to determine the airflow; correct?

11:04:53 **6** **MR. GOSS:** Object to form. Go ahead.

11:04:54 **7** **A.** That's correct. And let me explain how this

11:04:57 **8** works.

11:04:58 **9** **Q.** Well let me just ask a couple questions just

11:05:00 **10** so --

11:05:01 **11** **A.** No, I would like to explain.

11:05:02 **12** **Q.** Okay. But the answer to my question is

11:05:04 **13** "yes."

11:05:04 **14** **A.** That is --

11:05:05 **15** Yes.

11:05:06 **16** **Q.** Okay.

11:05:07 **17** **A.** So when you're dealing with an unsteady

11:05:09 **18** problem you have results at every time step. Think of

11:05:14 **19** it like a movie, and then you have the individual

11:05:19 **20** frames. If you want to know, let's say, what is

11:05:25 **21** happening to the flow or particles during that movie,

11:05:30 **22** you have two options: One, you can take a bunch of

11:05:38 **23** frames and smear them out. So think about a -- if

11:05:41 **24** you're looking at a fire, you're taking a bunch of

11:05:44 **25** snapshots of a fire. And a fire changes over time, I

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11:05:48 **1** think we would agree. And in one method you take

11:05:54 **2** maybe a hundred or a thousand snapshots and you

11:05:58 **3** average them together, so instead of a fire you get a

11:06:00 **4** blob. Okay. That's called a time-averaging

11:06:05 **5** technique. That I believe is the incorrect way of

11:06:08 **6** doing it, although that's the way Elghobashi did his

11:06:10 **7** work.

11:06:11 **8** **I** think you don't average. I think what you

11:06:13 **9** do is you take individual snapshots and you say what

11:06:18 **10** is the flow pattern in this frame, then what is the

11:06:20 **11** flow pattern in the next frame, and what is the flow

11:06:23 **12** pattern in the third frame. I think that's a much

11:06:26 **13** more rigorous way and accurate way of looking at the

11:06:29 **14** results. That's what I did.

11:06:31 **15** **And** as to your question, the TRN file is a

11:06:33 **16** frame. Think of it as a frame in a movie.

11:06:38 **17** **Q.** It's an individual frame; correct?

11:06:40 **18** **A.** That's what I said.

11:06:41 **19** **Q.** Okay. And there's no change in that frame

11:06:43 **20** with respect to temperature.

11:06:45 **21** **A.** I did not say that.

11:06:47 **22** **Q.** Well if you look at the TRN file, you're

11:06:50 **23** looking at a still frame at that point in time.

11:06:53 **24** **A.** Yes.

11:06:54 **25** **Q.** Okay. And you're running the streamline for

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11:07:08 **1** 60 seconds in that individual frame.

11:07:12 **2** **A.** That is correct. I'm tracking the path of

11:07:18 **3** the flow over a 60-second time period in that frame.

11:07:23 **4** **Q.** Okay. So my -- the answer to my question is

11:07:25 **5** "yes."

11:07:27 **6** **A.** I think I answered it.

11:07:32 **7** **Q.** You're running the streamline for 60 seconds

11:07:34 **8** in that individual frame.

11:07:35 **9** **A.** That is correct.

11:07:36 **10** **Q.** Okay. And in that frame you agree with me

11:07:57 **11** that what is happening at 5.02 seconds --

11:08:11 **12** **MR. GOSS:** Seven seconds? 5.07?

11:08:14 **13** **MR. ASSAAD:** 5.07 seconds. I don't know

11:08:16 **14** why I keep saying "2."

11:08:18 **15** **Q.** -- 5.07 seconds, the velocity vectors are

11:08:20 **16** going to be different at 6.07 seconds.

11:08:27 **17** **A.** In an unsteady flow they have to be

11:08:29 **18** different.

11:08:30 **19** **Q.** And we are in an unsteady flow here;

11:08:33 **20** correct?

11:08:34 **21** **A.** That is correct.

11:08:34 **22** **Q.** Okay. So the forces on a particle, the

11:08:37 **23** velocity forces are going to have different vectors

11:08:44 **24** that are on that particle at 6.07 seconds than were on

11:08:49 **25** 5.07 seconds; correct?

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11:08:51 **1** **A.** That was a very cumbersome question. Could

11:08:54 **2** you --

11:08:54 **3** **You** said the forces on a particle, period.

11:08:58 **4** Could you restate the question?

11:08:59 **5** **Q.** I will.

11:09:00 **6** Streamlines are based on velocity vectors.

11:09:06 **7** **A.** Correct.

11:09:07 **8** **Q.** And it's the tangent to the velocity vector.

11:09:10 **9** **A.** That is correct.

11:09:11 **10** **Q.** Okay. The velocity vector at 5.02 seconds

11:09:16 **11** -- 7 seconds -- is going to be different than the

11:09:18 **12** velocity vector at 6.07 seconds; correct?

11:09:22 **13** **A.** It has to be.

11:09:23 **14** **Q.** Because it's unsteady flow.

11:09:24 **15** **A.** Correct.

11:09:25 **16** **Q.** Okay. So when you run your streamline,

11:09:27 **17** okay, your streamline at one second, the velocity

11:09:33 **18** vectors at that time are going to be different than

11:09:42 **19** when you first started the streamline at five oh seven

11:09:45 **20** seconds.

11:09:46 **21** **A.** Well one second would be before 5.07, but I

11:09:50 **22** would say this. The streamlines change in time.

11:09:52 **23** **Q.** Okay.

11:09:53 **24** **A.** In an unsteady flow the flow patterns --

11:09:57 **25** everything is always changing, and that's why I want

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11:10:00 **1** to go back to the how do you handle it.
 11:10:02 **2** It's a movie, okay?
 11:10:04 **3** **Q.** I --
 11:10:05 **4** **A.** A fire is changing in time and you have to
 11:10:08 **5** decide to describe -- you have to --
 11:10:10 **6** If you want to describe the fire you have to
 11:10:12 **7** make a choice of how you describe it. Your choices
 11:10:14 **8** are to average all of it out and not account for the
 11:10:19 **9** changes in time. That's one choice. It's the
 11:10:22 **10** incorrect choice, but that's the choice Elghobashi
 11:10:24 **11** made. Your other choice is to look at each individual
 11:10:27 **12** frame, which I think is the more rigorous choice and
 11:10:29 **13** that's the choice I made. So your streamlines
 11:10:31 **14** necessarily change in time, because it's an unsteady
 11:10:35 **15** flow.
 11:10:36 **16** **Q.** And because they change in time, a
 11:10:39 **17** streamline that you show at 5.07 seconds is not going
 11:10:45 **18** to tell you where the particle is at 6.07 seconds;
 11:10:50 **19** correct?
 11:10:52 **20** **A.** I think you're confusing times here.
 11:10:55 **21** But yes, I would say this: Any TRN file
 11:11:03 **22** which is at a different -- it's a different snapshot
 11:11:06 **23** in a movie, will show a difference from any other
 11:11:10 **24** snapshot. I agree to that.
 11:11:12 **25** So the question is, are those snapshots
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11:11:15 **1** representative of what's actually happening.
 11:11:19 **2** **Q.** And to follow a particle and to account for
 11:11:23 **3** the chan -- for the unsteady state because of the
 11:11:28 **4** changing in velocity vectors you would have to run,
 11:11:33 **5** like a movie, a particle at 5.07 seconds, and then
 11:11:38 **6** look at that particle where it is at 6.07 seconds,
 11:11:44 **7** 7.07 seconds, because unless you follow the particle
 11:11:46 **8** in each frame you're not going to get the true effect
 11:11:54 **9** of the velocity vectors on a particle. Isn't that
 11:11:57 **10** correct?
 11:11:58 **11** **A.** I disagree.
 11:11:59 **12** **Q.** Okay. So if you look at your streamlines at
 11:12:16 **13** 20 seconds, are you telling me that the velocity
 11:12:20 **14** vector at 20 seconds is going to be the same velocity
 11:12:24 **15** vector acting on that point if you did a simulation
 11:12:30 **16** that was at 25.07 seconds?
 11:12:37 **17** **A.** I would say this. I ran thousands of
 11:12:41 **18** calculations, and for those calculations I tracked the
 11:12:48 **19** flow for 60 seconds and I observed no meaningful
 11:12:53 **20** change in the flow patterns, and I observed none of
 11:12:57 **21** those streamlines approaching the -- getting into the
 11:13:03 **22** surgical site. Now whether we call that above the
 11:13:05 **23** operating table, whether we call that the knee or the
 11:13:08 **24** hip or the operating theater, I don't care what you
 11:13:10 **25** call it. But I calculated streamlines, snapshots --
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11:13:16 **1** many thousands of snapshots and I never observed that.
 11:13:20 **2** Now it turns out I was overly ambitious. I
 11:13:23 **3** calculated the streamlines for 60 seconds, and now I
 11:13:27 **4** understand that, according to Elghobashi, the
 11:13:31 **5** particles would reach there in 43 seconds. So if I
 11:13:33 **6** could do it again knowing what I know now, I would
 11:13:35 **7** have only tracked the streamlines for 43 seconds. But
 11:13:39 **8** the resul -- the conclusion would be the same, in fact
 11:13:42 **9** it would be a stronger conclusion.
 11:13:43 **10** **Q.** Okay. So what's the answer to my question?
 11:13:46 **11** **A.** I don't recall what your question is.
 11:13:48 **12** **Q.** Because I don't recall what you're
 11:13:50 **13** answering, because it wasn't the answer to my
 11:13:52 **14** question, so let's go back.
 11:13:53 **15** My question is: If you look at your
 11:14:00 **16** streamlines at 20 seconds, is it your opinion that the
 11:14:03 **17** velocity vector at 20 seconds is going to be the same
 11:14:07 **18** velocity vector acting on that point if you did a
 11:14:13 **19** simulation that was at 25.07 seconds?
 11:14:16 **20** **A.** And the answer is no.
 11:14:17 **21** **Q.** Okay. Now you mentioned that you may have
 11:14:28 **22** used the 750 CFD analysis for your initial conditions?
 11:14:35 **23** **A.** I may have.
 11:14:37 **24** **Q.** How would you know?
 11:14:38 **25** **A.** I don't know. Sitting here now, I don't
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11:14:41 **1** know.
 11:14:41 **2** **Q.** So --
 11:14:45 **3** **A.** And of course it doesn't matter.
 11:14:47 **4** **Q.** I understand that, according to you. But --
 11:14:51 **5** **A.** No. No, that's not true.
 11:14:53 **6** **Q.** Okay.
 11:14:53 **7** **A.** According to how CFD works it doesn't
 11:14:56 **8** matter. As I've said today, and as I've said in our
 11:15:00 **9** last deposition, the actual initial conditions don't
 11:15:02 **10** matter. You don't need the same initial conditions to
 11:15:05 **11** get to the same result, so it doesn't matter.
 11:15:07 **12** **Q.** Did you read plaintiffs' motion to exclude
 11:15:10 **13** you in the general cause part?
 11:15:15 **14** **A.** Yes.
 11:15:15 **15** **Q.** And did you read the transcript of the Court
 11:15:15 **16** with respect --
 11:15:17 **17** **A.** Yes, I did.
 11:15:24 **18** **Q.** So just to sum it up. It's my understanding
 11:15:28 **19** that your -- that it's your opinion that initial
 11:15:31 **20** conditions don't matter.
 11:15:35 **21** **A.** No.
 11:15:36 **22** Here's my opinion, and I want to be very
 11:15:39 **23** clear. Initial conditions -- You need initial
 11:15:44 **24** conditions to get a solution, but provided your
 11:15:47 **25** initial conditions are good enough, you should come to
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11:15:49 **1** the same ultimate result and the same conclusion.
 11:15:54 **2** As I said earlier in this deposition, your
 11:15:55 **3** initial conditions could be so crazy that it could
 11:15:58 **4** cause divergence. So your initial conditions may
 11:16:02 **5** matter in that circumstance, but if your initial
 11:16:05 **6** conditions are good enough, you will come to the
 11:16:07 **7** correct ultimate solution.
 11:16:09 **8** **Q.** Okay. And the transient model is dependent
 11:16:21 **9** on the initial conditions; correct?
 11:16:27 **10** **A.** Well I think I just answered that, but let
 11:16:29 **11** me answer it again in a way that maybe makes more
 11:16:32 **12** sense.
 11:16:33 **13** **Q.** Well can you answer that question "yes" or
 11:16:35 **14** "no"?
 11:16:37 **15** **A.** It's not a question that can be answered
 11:16:39 **16** "yes" or "no."
 11:16:40 **17** **Q.** Okay.
 11:16:40 **18** **A.** The answer is -- You asked does a transient
 11:16:44 **19** model depend on the initial conditions. And I just
 11:16:47 **20** gave an example of where the model does depend on the
 11:16:51 **21** initial conditions. You could give a crazy initial
 11:16:53 **22** condition. If I assumed the air in this room was a
 11:16:56 **23** thousand degrees and then I started my calculation, it
 11:16:59 **24** may diverge. But if I gave reasonable initial
 11:17:03 **25** conditions, it wouldn't diverge. So provided your
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11:17:07 **1** initial conditions are good enough, they do not affect
 11:17:09 **2** the ultimate conclusion of the calculations.
 11:17:13 **3** **Q.** You agree with me that the first time step
 11:17:16 **4** depends on the initial condition.
 11:17:17 **5** **A.** I agree the first time step depends on the
 11:17:20 **6** initial condition.
 11:17:37 **7** **Q.** And you agree with me that the time it takes
 11:17:44 **8** for you to determine quasi-steady state depends on the
 11:17:49 **9** initial conditions.
 11:17:50 **10** **A.** It may.
 11:18:27 **11** (Abraham Exhibit 3 marked for
 11:18:27 **12** identification.)
 11:18:27 **13** BY MR. ASSAAD:
 11:18:49 **14** **Q.** Do you recognize what's been marked as
 11:18:51 **15** Exhibit 3?
 11:18:54 **16** **A.** Yes, I do.
 11:18:58 **17** **Q.** What is Exhibit 3?
 11:19:00 **18** **A.** Exhibit 3 is a journal publication which I
 11:19:02 **19** authored.
 11:19:04 **20** **Q.** Did you author it with anybody else?
 11:19:05 **21** **A.** Yes.
 11:19:06 **22** **Q.** Who?
 11:19:07 **23** **A.** Brian Plourde and Lauren Vallez.
 11:19:11 **24** **Q.** You agree with me that there's information
 11:19:13 **25** in Exhibit 3 that was not in your expert report that
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11:19:17 **1** was submitted in the general causation case.
 11:19:19 **2** **A.** I agree.
 11:19:20 **3** **Q.** Okay. Does the --
 11:19:26 **4** Does Exhibit 3 contain any results of the
 11:19:34 **5** 505 modeling?
 11:19:37 **6** **A.** No.
 11:19:46 **7** **Q.** Do you recall that in your deposition you
 11:19:48 **8** indicated to me that -- that the article contained
 11:19:52 **9** results for the 505 modeling?
 11:19:53 **10** **A.** If I did, then that was an error.
 11:20:24 **11** (Abraham Exhibit 4 marked for
 11:20:24 **12** identification.)
 11:20:25 **13** BY MR. ASSAAD:
 11:20:25 **14** **Q.** I'd like you to look to page 79 of your --
 11:20:27 **15** Strike that.
 11:20:28 **16** Exhibit 4 is a copy of your deposition taken
 11:20:32 **17** on July 20th, 2017. Do you recognize this deposition?
 11:20:40 **18** **A.** Yes.
 11:20:43 **19** **Q.** And the -- the deposition was taken under
 11:20:48 **20** oath; correct?
 11:20:49 **21** **A.** Yes.
 11:20:50 **22** **Q.** And the court reporter was the astonishing
 11:20:55 **23** Stirewalt & Associates.
 11:20:56 **24** Do you recall that?
 11:20:56 **25** **A.** Yes.
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11:20:58 **1** MR. GOSS: Inestimable.
 11:21:01 **2** **Q.** Let's look at page 79.
 11:21:08 **3** And you had a chance to go back and read and
 11:21:10 **4** review your deposition for corrections.
 11:21:12 **5** **A.** That is correct.
 11:21:13 **6** **Q.** Okay. And you actually did that; correct?
 11:21:15 **7** **A.** That is correct.
 11:21:16 **8** **Q.** Okay. And you read it carefully; correct?
 11:21:18 **9** **A.** Yes.
 11:21:19 **10** **Q.** And you wanted to be as accurate as
 11:21:22 **11** possible.
 11:21:22 **12** **A.** That is right.
 11:21:24 **13** **Q.** And you read it again this week; correct?
 11:21:26 **14** **A.** That is correct.
 11:21:27 **15** **Q.** If you look at page 79, line 4, I asked you:
 11:21:31 **16** "Okay. And I know you -- in your
 11:21:33 **17** journal article you looked at 505
 11:21:35 **18** as well?"
 11:21:35 **19** And your answer was "yes."
 11:21:37 **20** **A.** That is correct.
 11:21:38 **21** **Q.** Are you saying that is incorrect?
 11:21:40 **22** **A.** Yes, I am.
 11:21:40 **23** **Q.** And you did not correct that in your errata
 11:21:43 **24** sheet; correct?
 11:21:44 **25** **A.** That is correct.
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11:21:44 **1** Q. And you did not --
 11:21:45 **2** A. I did not notice that error in my errata
 11:21:48 **3** sheet.
 11:21:58 **4** Q. Now in the 750 report you only looked at 264
 11:22:04 **5** time steps; correct?
 11:22:05 **6** A. Incorrect.
 11:22:10 **7** Q. The results you looked at and the
 11:22:13 **8** streamlines you created was on the 264 TRN file.
 11:22:16 **9** A. That is correct.
 11:22:19 **10** Q. And the temperature of the Bair Hugger was
 11:22:20 **11** 41 degrees Celsius; correct?
 11:22:22 **12** A. Yes.
 11:22:23 **13** Q. The exhaust of the Bair Hugger.
 11:22:24 **14** A. Correct.
 11:22:25 **15** Q. Okay. And you looked at the Bair Hugger as
 11:22:29 **16** only being on, correct, in the 750 report?
 11:22:32 **17** A. Yes.
 11:22:33 **18** Q. And there you used a nine-million-grid mesh.
 11:22:37 **19** A. I don't recall the size of the mesh.
 11:22:39 **20** Q. And the time step that was used was .01
 11:22:42 **21** seconds.
 11:22:42 **22** A. I don't recall the time step.
 11:22:44 **23** Q. Look at page 169 of your deposition of
 11:22:48 **24** Exhibit 4.
 11:22:59 **25** A. (Witness complying.)
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11:23:05 **1** Q. Page -- Line 24.
 11:23:10 **2** "So if I represent to you that the
 11:23:12 **3** TRN files says .01 seconds, would
 11:23:15 **4** you disagree with that?
 11:23:16 **5** ANSWER: I would not disagree with
 11:23:18 **6** that."
 11:23:18 **7** So sitting here today, do you disagree that
 11:23:21 **8** the time step was .01 seconds?
 11:23:23 **9** A. No.
 11:23:25 **10** Q. And if I recall correctly, the 264.TRN was a
 11:23:30 **11** simulation time of 1.2 seconds. That sound about
 11:23:33 **12** right?
 11:23:34 **13** A. The T -- the 264 TRN corresponded to a 1.2
 11:23:40 **14** second --
 11:23:40 **15** Q. Okay.
 11:23:40 **16** A. -- simulation time.
 11:23:45 **17** Q. And is that as far forward as you ran the
 11:23:49 **18** TRN file, 264?
 11:23:52 **19** A. No.
 11:23:52 **20** MR. GOSS: The simulation?
 11:23:54 **21** Q. The simulation?
 11:23:55 **22** A. No.
 11:23:56 **23** Q. How far did you run it forward?
 11:23:57 **24** A. I think I stated in my deposition that I had
 11:23:59 **25** a file at 300, and one earlier, maybe 263. I don't
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11:24:06 **1** recall how far forward I ran it.
 11:24:08 **2** Q. In your report --
 11:24:12 **3** In your publication you mentioned that --
 11:24:38 **4** You said, "approximately two thousand time-step
 11:24:41 **5** calculations were completed."
 11:24:42 **6** A. Can you direct me to where that's stated?
 11:24:45 **7** Q. Yes, page 8.
 11:24:48 **8** MR. GOSS: Are we talking about his 750
 11:24:51 **9** report or his --
 11:24:51 **10** MR. ASSAAD: Publication.
 11:24:52 **11** MR. GOSS: -- Gareis report?
 11:24:54 **12** Oh, on the publication.
 11:24:55 **13** Q. Publication. I'm sorry.
 11:25:08 **14** A. Yes, I see that.
 11:25:24 **15** Q. So in Exhibit Number 3, which is your
 11:25:28 **16** report, on page 8 --
 11:25:31 **17** MR. GOSS: Article.
 11:25:31 **18** MR. ASSAAD: Huh?
 11:25:32 **19** MR. GOSS: The article; right?
 11:25:34 **20** MR. ASSAAD: Article.
 11:25:35 **21** MR. GOSS: Okay. Thanks.
 11:25:35 **22** MR. ASSAAD: Exhibit 3.
 11:25:36 **23** MR. GOSS: Thank you.
 11:25:37 **24** Q. You mention that you ran 2,000 time-step
 11:25:44 **25** calculations on the 750 model; correct?
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11:25:47 **1** A. Incorrect.
 11:25:49 **2** Q. "Approximately 2,000 time-step
 11:25:51 **3** calculations."
 11:25:51 **4** A. Incorrect.
 11:25:59 **5** Q. How many time step calculations were
 11:26:00 **6** performed on the 750?
 11:26:04 **7** A. Well what you're referring to here doesn't
 11:26:07 **8** relate to the 750. If you read the --
 11:26:10 **9** Let me read the paragraph. "One final
 11:26:12 **10** numerical calculation was performed with the cessation
 11:26:17 **11** of heated airflow from the" convective -- "convection
 11:26:21 **12** device. The spent air of the convection device was
 11:26:25 **13** converted to an adiabatic" -- A-D-I-A-B-A-T-I-C --
 11:26:32 **14** "no-slip wall in the simulation. The results were
 11:26:36 **15** obtained using the LES method previously described.
 11:26:40 **16** While approximately 2,000 time-steps" were --
 11:26:46 **17** "calculations were completed, virtually no difference
 11:26:48 **18** was found in the streamline pattern. That is, the
 11:26:52 **19** room flow patterns with and without the convection
 11:26:54 **20** device were nearly identical. A graphical image of
 11:26:58 **21** the inlet streamlines is shown in both foot and side
 11:27:01 **22** view in Figure 11."
 11:27:03 **23** Q. So you turned the Bair Hugger off?
 11:27:05 **24** A. That paragraph refers to me turning the Bair
 11:27:08 **25** Hugger off.
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11:27:09 **1** Q. Okay. So you ran the Bair Hugger off in the
 11:27:12 **2** publication.
 11:27:12 **3** A. That's correct.
 11:27:14 **4** Q. You didn't provide those results in your
 11:27:16 **5** expert report; correct?
 11:27:17 **6** A. No. And they are not relevant to the expert
 11:27:20 **7** report.
 11:27:21 **8** Q. But they weren't provided in the expert
 11:27:22 **9** report; correct?
 11:27:23 **10** A. They were not provided, and they were not
 11:27:24 **11** relevant because my expert report wanted to answer the
 11:27:30 **12** question does the Bair Hugger bring potentially
 11:27:33 **13** unclean air to the surgical site. And running a case
 11:27:35 **14** without the Bair Hugger is immaterial to that
 11:27:38 **15** question.
 11:27:39 **16** MR. ASSAAD: Move to strike the
 11:27:40 **17** nonresponsive portion of his answer.
 11:28:05 **18** Q. Going to page 5 of Exhibit 3, your article.
 11:28:26 **19** On the bottom paragraph you mention that "...over
 11:28:32 **20** 2,000 time steps were made following the achievement
 11:28:34 **21** of the results already provided."
 11:28:37 **22** Were those time steps with the Bair Hugger
 11:28:39 **23** on?
 11:28:40 **24** A. Yes.
 11:28:41 **25** Q. Okay. So the results are the 264.TRN file;
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11:28:47 **1** correct?
 11:28:48 **2** A. Yes.
 11:28:48 **3** Q. And you ran it for another 2,000 time steps
 11:28:51 **4** after that; correct?
 11:28:52 **5** A. Yes.
 11:28:54 **6** Q. That wasn't provided in your expert report
 11:28:56 **7** that was submitted for general causation; correct?
 11:28:58 **8** A. That is correct.
 11:28:58 **9** Q. Okay. And how --
 11:29:00 **10** A. But what was provided was a statement to
 11:29:02 **11** this effect. I stated in my causation report that if
 11:29:05 **12** you looked at other time steps the results would not
 11:29:08 **13** -- would not materially change.
 11:29:10 **14** Q. So my understanding is --
 11:29:13 **15** Well let me ask you this: What was the time
 11:29:15 **16** step -- What was the time step, like how many seconds
 11:29:20 **17** between -- for each time step?
 11:29:22 **18** A. I don't recall.
 11:29:22 **19** Q. Would you have --
 11:29:23 **20** Would it have been at still .01 seconds?
 11:29:26 **21** A. It may have been.
 11:29:27 **22** Q. Okay. So if it was .01 seconds, we're
 11:29:30 **23** looking at another 20 seconds of simulation time.
 11:29:33 **24** A. That may be true.
 11:29:34 **25** Q. Okay. And when you ran it forward over
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11:29:38 **1** 2,000 time steps did you have any problems with
 11:29:40 **2** convergence?
 11:29:42 **3** A. I did not --
 11:29:44 **4** I do not recall having any problems with
 11:29:46 **5** convergence.
 11:29:47 **6** Q. Were there any failures?
 11:29:48 **7** A. I do not recall any failures.
 11:29:50 **8** Q. And if there was a failure, that would be
 11:29:52 **9** something that you would recall; correct?
 11:29:54 **10** A. It is likely I would recall it, but I may
 11:29:57 **11** not recall it.
 11:29:58 **12** Q. Okay. So it's possible that your CFD could
 11:30:00 **13** have failed doing the 750?
 11:30:02 **14** A. I would say this. I do not recall it
 11:30:04 **15** failing doing the 750.
 11:30:06 **16** Q. But you're not saying it would not be
 11:30:08 **17** possible.
 11:30:09 **18** A. Anything is possible.
 11:30:10 **19** What I'm telling you is I do not recall any
 11:30:12 **20** failures when I ran these calculations.
 11:30:15 **21** Q. Okay. And if you look at -- if you continue
 11:30:22 **22** it talks about Figure 6 showing an approximately 2,500
 11:30:27 **23** time steps; correct?
 11:30:28 **24** A. Yes.
 11:30:29 **25** Q. So now you at least ran it 2,500 time steps;
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11:30:33 **1** correct?
 11:30:34 **2** A. Correct.
 11:30:39 **3** Q. In addition, in your published paper you
 11:30:42 **4** also ran the calculations at 43 degrees Celsius for
 11:30:45 **5** the Bair Hugger exit temperature; correct?
 11:30:48 **6** A. I'll clarify your question and then I'll
 11:30:50 **7** answer it. The Bair Hugger is set at 43. What that
 11:30:54 **8** means is the air going from the hose into the blanket
 11:30:58 **9** is 43 Celsius. Now the -- when the air comes out of
 11:31:03 **10** the blanket it's not 43 any more, it varies depending
 11:31:06 **11** on where you are, but it varies typically between 41
 11:31:10 **12** and the low 30s. Okay. So 41 degrees is the highest
 11:31:20 **13** temperature the air exits the blanket, 43 degrees is
 11:31:26 **14** the air temperature into the blanket.
 11:31:28 **15** So we just have to be clear when we say "the
 11:31:30 **16** Bair Hugger temperature." There is more than one
 11:31:33 **17** temperature.
 11:31:33 **18** Q. I understand that.
 11:31:34 **19** You also ran the CFD model with the exit
 11:31:37 **20** temperature out of the Bair Hugger blanket at 43
 11:31:40 **21** degrees Celsius.
 11:31:41 **22** A. That is correct.
 11:31:41 **23** Q. Okay. So you ran it both at 41 degrees
 11:31:44 **24** Celsius and at 43 degrees Celsius; correct?
 11:31:46 **25** A. Correct.
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11:31:46 **1** Q. Have you provided those TRN files?
 11:31:48 **2** A. No.
 11:31:49 **3** Q. Where are those TRN files?
 11:31:53 **4** A. I would not have them any more because I
 11:31:55 **5** don't need to keep them. I have the master file.
 11:31:57 **6** Q. So you have the master file for 43 degrees
 11:32:01 **7** Celsius?
 11:32:01 **8** A. I have the master file that can be used to
 11:32:03 **9** recreate any of these results. I don't keep the
 11:32:05 **10** individual snapshots, but I keep the 264 TRN, which
 11:32:10 **11** can be used to recreate all of this.
 11:32:13 **12** Q. So was the 2540 TRN file created off the
 11:32:17 **13** 264.TRN file?
 11:32:20 **14** A. What does "created off" mean?
 11:32:22 **15** Q. You said --
 11:32:23 **16** You said you have the 264 TRN file that you
 11:32:26 **17** could create all these scenarios off of; correct?
 11:32:29 **18** A. Yes.
 11:32:30 **19** Q. So was the TRN file 2540.TRN, was that
 11:32:35 **20** created from the 26 -- except for the boundary
 11:32:39 **21** conditions, was everything else there from the 264.TRN
 11:32:43 **22** file?
 11:32:44 **23** A. The 254 --
 11:32:46 **24** The 2540 and the 264 are identical except
 11:32:51 **25** for the flow rate of the Bair Hugger.

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11:32:57 **1** Q. And how long did you run the simulation for
 11:33:01 **2** 43 degrees Celsius?
 11:33:02 **3** A. I don't recall. But I would have run it
 11:33:04 **4** until quasi-steady state was achieved.
 11:33:23 **5** Q. So just so I understand it, you have results
 11:33:27 **6** here in your published paper, Exhibit 3, for 900 time
 11:33:31 **7** steps; correct? Which is (a) and (b) of the diagram.
 11:33:38 **8** A. Well it says "approximately 900."
 11:33:40 **9** Q. Okay. And you also have results for your
 11:33:42 **10** time steps of 2500 time steps in your published paper,
 11:33:48 **11** Exhibit 3.
 11:33:48 **12** A. Yeah, and it's "approximately 2,500." And
 11:33:51 **13** they're shown in figures 6 (a), (b), (c) and (d).
 11:33:55 **14** Q. I understand that.
 11:33:55 **15** Can you just please answer my question?
 11:33:57 **16** A. Well I think I did.
 11:33:58 **17** Q. I didn't ask you where were they shown. I
 11:34:00 **18** just asked you did you have it in your published
 11:34:02 **19** paper.
 11:34:02 **20** Finally, you -- the mesh that is depicted on
 11:34:11 **21** your published paper, Exhibit 3, Figure Number 3, is a
 11:34:19 **22** 60-million-cell mesh; correct?
 11:34:22 **23** A. I believe that's true.
 11:34:23 **24** Q. And that was not used to get the results of
 11:34:27 **25** the graphs or the figures of Figures 4, 5, 6 and 7;

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11:34:36 **1** correct?
 11:34:37 **2** A. That's incorrect.
 11:34:37 **3** So what happens is you have to demonstrate
 11:34:40 **4** your results are mesh independent. And what that
 11:34:44 **5** means is --
 11:34:44 **6** Q. I know what that means. But did -- Are
 11:34:48 **7** those -- Withdraw that question.
 11:34:50 **8** The -- The Figure 4. Figure 4, those
 11:34:57 **9** diagrams of streamlines, were they created off a mesh
 11:35:02 **10** of 60 million cells, 12 million cells, or is it 9
 11:35:08 **11** million cells?
 11:35:09 **12** A. If I recall correctly, these were created
 11:35:12 **13** using a mesh of 9 to 10 million cells.
 11:35:16 **14** Q. Okay. And the same question for Figure 4.
 11:35:21 **15** A. You just asked for Figure 4.
 11:35:23 **16** Q. Oh. Figure 5. I'm sorry.
 11:35:24 **17** A. Same answer.
 11:35:27 **18** Q. Figure 6?
 11:35:29 **19** A. Same answer.
 11:35:31 **20** Q. Figure 7?
 11:35:33 **21** A. Same answer.
 11:35:35 **22** Q. Figure 8?
 11:35:37 **23** A. Same answer.
 11:35:38 **24** Q. Figure 9?
 11:35:40 **25** A. Same answer.

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11:35:45 **1** Q. Figure 10?
 11:35:46 **2** A. Same answer.
 11:35:47 **3** Q. Figure 11?
 11:35:49 **4** A. Same answer.
 11:35:58 **5** Q. Is there anywhere in your published paper
 11:36:04 **6** that indicates that the mesh used to get those results
 11:36:12 **7** of Figures 4, 5, 6, 7, 8, 9, and 10 is not the mesh
 11:36:23 **8** that's depicted in Figure 3?
 11:36:38 **9** A. What I say in the paper is, "To achieve
 11:36:42 **10** accuracy, multiple mesh deployments were used up to
 11:36:46 **11** approximately 60 million elements." Now what that
 11:36:48 **12** means is multiple mesh sizes were used. There is the
 11:36:55 **13** expectation, the reader has the expectation that this
 11:36:59 **14** means I achieved mesh independence, okay?
 11:37:02 **15** Q. My question is specifically: Is there
 11:37:04 **16** anywhere in your paper that indicates that the mesh
 11:37:07 **17** that was used to obtain the results in Figures 4
 11:37:10 **18** through 10 is not the same mesh that is depicted in
 11:37:14 **19** Figure 3?
 11:37:15 **20** A. I'm answering your question.
 11:37:17 **21** Q. It's a simple "yes" or "no."
 11:37:18 **22** A. It is not a simple "yes" or "no."
 11:37:20 **23** Q. If you can't answer that question, just let
 11:37:22 **24** me know, but I want a "yes" or "no."
 11:37:24 **25** A. I can answer the question. It is not a

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11:37:26 **1** simple "yes" or "no." Would you like me to answer the
 11:37:28 **2** question?
 11:37:28 **3** **Q.** No. If it's not a simple "yes" or "no," I
 11:37:32 **4** don't want --
 11:37:32 **5** If it's not in there, that's fine; if it's
 11:37:33 **6** in there, you could show it to me. But I don't need
 11:37:33 **7** a --
 11:37:33 **8** **A.** No. Hold --
 11:37:34 **9** **Q.** I don't need an explana --
 11:37:34 **10** **A.** You just did a bait and switch.
 11:37:36 **11** **Q.** I don't need an explanation of why you think
 11:37:37 **12** a reader might interpret it that way.
 11:37:39 **13** Is there anywhere that it's specifically
 11:37:42 **14** written in your report that Figures 4 through 10, that
 11:37:49 **15** the mesh utilized to create those figures is not the
 11:37:52 **16** 60 million mesh depicted in Figure 3?
 11:37:55 **17** **MR. GOSS:** I'm just going to object to
 11:37:57 **18** form. I'm not seeing that Figure 3 says anything
 11:37:59 **19** about 60 million mesh. But subject to that, if you
 11:38:02 **20** have a different answer, go ahead.
 11:38:04 **21** **A.** Can you re-ask the question?
 11:38:07 **22** **Q.** You know what, I will move on.
 11:38:10 **23** Your peer-reviewed report was published in
 11:38:18 **24** August of 2017?
 11:38:22 **25** **A.** I don't recall the date it actually
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11:38:25 **1** appeared.
 11:38:27 **2** **Q.** Well on the first page it says published
 11:38:29 **3** August 8th, 2017.
 11:38:34 **4** First page. Like, there's a calendar
 11:38:38 **5** picture.
 11:38:40 **6** **A.** Oh.
 11:38:41 **7** **MR. GOSS:** [Indicating.]
 11:38:41 **8** **A.** So it was published online August 8th, 2017.
 11:38:49 **9** **Q.** So your peer-reviewed report was published
 11:38:52 **10** after we had your deposition in the general causation
 11:38:55 **11** case; correct?
 11:38:56 **12** **A.** That is correct.
 11:39:00 **13** **Q.** And *Numerical Heat Transfer*, is that a
 11:39:04 **14** peer-reviewed publication?
 11:39:06 **15** **A.** Yes. I would say it's the top journal in
 11:39:09 **16** the field.
 11:39:10 **17** **Q.** Okay. That wasn't my question, sir.
 11:39:12 **18** **A.** Well I answered your question "yes."
 11:39:15 **19** **Q.** Okay. Did you submit your paper to any
 11:39:28 **20** other publication?
 11:39:29 **21** **A.** No.
 11:39:36 **22** **Q.** And your paper was peer reviewed; correct?
 11:39:38 **23** **A.** Correct.
 11:39:40 **24** **Q.** Did you receive any comments from any peer
 11:39:42 **25** reviewers?
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11:39:44 **1** **A.** I received the acceptance letter from the
 11:39:46 **2** editor-in-chief.
 11:39:47 **3** **Q.** That wasn't my question.
 11:39:48 **4** **A.** No.
 11:39:51 **5** **Q.** Do you know who reviewed your paper?
 11:39:53 **6** **A.** I do not.
 11:39:54 **7** **Q.** Do you know how many people reviewed your
 11:39:56 **8** paper?
 11:39:56 **9** **A.** I do not.
 11:39:58 **10** **Q.** Do you know if anyone reviewed your paper?
 11:40:00 **11** **A.** Yes.
 11:40:01 **12** **Q.** How do you know people reviewed your paper?
 11:40:03 **13** **A.** Well the acceptance letter says the paper
 11:40:06 **14** was reviewed.
 11:40:11 **15** **Q.** Do you know the type of review process
 11:40:12 **16** exists for *Numerical Heat Transfer*?
 11:40:15 **17** **A.** I do not.
 11:40:16 **18** **Q.** Do you know what a double-blind review
 11:40:18 **19** process is?
 11:40:19 **20** **A.** Yes, I do.
 11:40:19 **21** **Q.** What is a double-blind review process?
 11:40:22 **22** **A.** A double-blind review process is when papers
 11:40:24 **23** are sent out to reviewers and the reviewers don't know
 11:40:30 **24** the authors and the authors don't know the reviewers.
 11:40:36 **25** **Q.** So when you submit -- when you submitted
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11:40:38 **1** your paper did you have to make any changes before --
 11:40:43 **2** requested by the -- by the publication?
 11:40:45 **3** **A.** I don't recall if I made any changes.
 11:40:47 **4** **Q.** Okay. So there weren't any questions or
 11:40:49 **5** changes by any of the reviewers.
 11:40:50 **6** **A.** I don't recall.
 11:41:02 **7** **Q.** Now Ms. Vallez is a co-author of the paper;
 11:41:09 **8** correct?
 11:41:10 **9** **A.** Correct.
 11:41:10 **10** **Q.** And she did not make any significant
 11:41:12 **11** contribution to the paper; correct?
 11:41:18 **12** **A.** I wrote the pa...
 11:41:20 **13** I wrote the entire paper.
 11:41:22 **14** **Q.** So you agree with me that she did not make a
 11:41:24 **15** significant contribution.
 11:41:26 **16** **A.** If she made a contribution, it would have
 11:41:28 **17** been very minor.
 11:41:30 **18** **Q.** I mean, according to your testimony in
 11:41:31 **19** general cause, she provided no work or calculations
 11:41:34 **20** with respect to the CFD analysis; correct?
 11:41:37 **21** **A.** That's --
 11:41:37 **22** That's not true. I think what I said was
 11:41:39 **23** she provided nothing meaningful, or she provided very
 11:41:42 **24** little.
 11:42:08 **25** **Q.** Can you turn to page 40 of your deposition,
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11:42:11 **1** Exhibit Number 4.
 11:42:17 **2** **A.** (Witness complying.)
 11:42:21 **3** **Q.** Question, Line 3:
 11:42:23 **4** "Did Mr. Plourde or Ms. Vallez
 11:42:27 **5** provide any work with respect to
 11:42:29 **6** the CFD analysis you performed on
 11:42:30 **7** the 750?
 11:42:33 **8** ANSWER: No."
 11:42:35 **9** Was that your testi --
 11:42:35 **10** **A.** I --
 11:42:35 **11** **Q.** Was that your testimony back then?
 11:42:36 **12** MR. GOSS: I'm just going to object to the
 11:42:38 **13** improper impeachment, I don't think it's inconsistent
 11:42:41 **14** with what he said, but you can answer.
 11:42:43 **15** **A.** That's what it says, but I recall saying
 11:42:45 **16** that they weren't -- they did not provide any
 11:42:47 **17** meaningful work, they didn't provide any meaningful
 11:42:51 **18** contributions to the 750.
 11:42:53 **19** **Q.** Okay. Well if you want to turn to page 42,
 11:42:56 **20** and look at line 15.
 11:43:04 **21** **A.** Yeah.
 11:43:07 **22** **Q.** Is that where you recall saying, "The
 11:43:10 **23** problem was too complex and the timeline was too short
 11:43:12 **24** for him to contribute meaningfully?"
 11:43:14 **25** **A.** That's what it says.
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11:43:15 **1** **Q.** So Mr. Plourde did not contribute anything
 11:43:19 **2** meaningfully to this paper.
 11:43:20 **3** **A.** That is correct.
 11:43:21 **4** **Q.** Because it was too complex for him.
 11:43:23 **5** **A.** Well I say here it was complex and short
 11:43:26 **6** timeline.
 11:43:29 **7** **Q.** And it was too challenging for Ms. Vallez.
 11:43:32 **8** **A.** Well what I say in this deposition page 42
 11:43:36 **9** is she -- lines 2 through 4. "It turns" --
 11:43:36 **10** **Q.** Well why don't you --
 11:43:43 **11** Why don't you read line 1 as well --
 11:43:43 **12** **A.** Okay.
 11:43:45 **13** **Q.** -- because that's a really good line.
 11:43:47 **14** **A.** She actually --
 11:43:48 **15** I'll start with line 1 and I'll read through
 11:43:50 **16** line 6.
 11:43:51 **17** "She actually didn't accomplish
 11:43:52 **18** anything. The -- It turns out the
 11:43:55 **19** simulation was very challenging...
 11:43:56 **20** she wasn't able to contribute
 11:43:58 **21** meaningfully in any way. She
 11:44:00 **22** didn't contribute in any way to
 11:44:02 **23** the generation of the mesh, to the
 11:44:04 **24** setting of the boundary
 11:44:05 **25** conditions, and to the analysis."
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11:44:06 **1** And I think that's consistent with what I just
 11:44:08 **2** said here.
 11:44:09 **3** **Q.** Okay. But nevertheless, you put her name
 11:44:13 **4** and Mr. Plourde's name on the -- on the publication.
 11:44:18 **5** MR. GOSS: Object to form.
 11:44:19 **6** **A.** That is correct.
 11:44:20 **7** MR. ASSAAD: Basis?
 11:44:20 **8** MR. GOSS: I don't know that he put his
 11:44:22 **9** name on it.
 11:44:24 **10** **Q.** Well you submitted the -- the publication;
 11:44:26 **11** correct?
 11:44:27 **12** **A.** That is correct.
 11:44:28 **13** **Q.** And all correspondence with respect to this
 11:44:30 **14** com -- this publication, Exhibit 3, is directed to
 11:44:33 **15** you; correct?
 11:44:34 **16** **A.** Correct.
 11:44:35 **17** **Q.** And you're the lead author of this
 11:44:37 **18** publication; correct?
 11:44:38 **19** **A.** Correct.
 11:44:42 **20** **Q.** Why did you add them to the journal?
 11:44:46 **21** **A.** Because they tried, and when students try,
 11:44:51 **22** but if a professor has to step in and complete the
 11:44:53 **23** work, I think it's just right to include them.
 11:45:36 **24** And I actually want to correct the record.
 11:45:39 **25** **Q.** There's no question pending.
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11:45:41 **1** **A.** Well I'm going to correct the record anyways
 11:45:43 **2** unless you instruct me not to.
 11:45:45 **3** **Q.** There's no question pending.
 11:45:46 **4** MR. ASSAAD: Counselor, can you please --
 11:45:47 **5** MR. GOSS: You can wait. You can wait,
 11:45:49 **6** John.
 11:45:52 **7** THE WITNESS: Okay.
 11:45:52 **8** BY MR. ASSAAD:
 11:45:55 **9** **Q.** Are you familiar that Taylor & Francis are
 11:45:59 **10** the publishers for *Numerical Heat Transfer*?
 11:46:02 **11** **A.** Yes.
 11:46:03 **12** **Q.** Have you looked at any of their publications
 11:46:05 **13** with respect to avoiding unethical authorship on the
 11:46:09 **14** journal?
 11:46:10 **15** **A.** I may have. I don't recall if I did.
 11:46:24 **16** (Abraham Exhibit 5 marked for
 11:46:24 **17** identification.)
 11:46:24 **18** BY MR. ASSAAD:
 11:46:25 **19** **Q.** Exhibit 5 is a document from Taylor Francis
 11:46:30 **20** under -- from Editor Resources titled, "Avoiding
 11:46:34 **21** unethical authorship on your journal."
 11:46:37 **22** And I would like you to turn to page 2 that
 11:46:42 **23** defines a co-author as any person who made a
 11:46:45 **24** significant contribution to a journal and who shares
 11:46:49 **25** responsibility and accountability for the results.
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11:46:50 **1** Did I read that correctly?
 11:46:52 **2 A.** Yes, you did.
 11:46:55 **3 Q.** Do you agree with me that Mr. Plourde and
 11:46:57 **4** Ms. Vallez did not make any significant contribution
 11:46:59 **5** to the work; correct?
 11:47:00 **6 A.** I disagree.
 11:47:01 **7 Q.** So you disagree with your prior testimony.
 11:47:03 **8 A.** No, I don't.
 11:47:05 **9 Q.** Do you think "meaningful" and "significant"
 11:47:07 **10** mean two different things?
 11:47:08 **11 A.** You are confused.
 11:47:10 **12 Q.** I am not --
 11:47:10 **13 A.** If you would allow me --
 11:47:10 **14 Q.** -- confused, sir.
 11:47:10 **15 A.** If you would --
 11:47:11 **16 Q.** Don't tell me what I am or am not. Okay?
 11:47:15 **17** MR. GOSS: Can you just answer his --
 11:47:17 **18 Q.** Answer my question.
 11:47:19 **19 A.** Mr. Plourde --
 11:47:21 **20** If you read the first item here, first of
 11:47:23 **21** all, they have made significant contributions to the
 11:47:27 **22** work reported, whether it's in the research conception
 11:47:30 **23** or design, acquisition of data, analysis and
 11:47:33 **24** interpretation, or in all of these areas.
 11:47:37 **25** And what we read from my deposition was
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11:47:39 **1** related to the actual CFD calculations, but you have
 11:47:42 **2** to recognize there's more in here than the
 11:47:44 **3** calculations. There's an entire section in this paper
 11:47:49 **4** on experimental validation, and I want to turn our
 11:47:53 **5** attention to Figure 12. Mr. Plourde is shown in
 11:47:57 **6** Figure 12. Mr. Plourde is shown in Figure 13. So
 11:48:03 **7** regardless of whether he made any contributions to the
 11:48:05 **8** CFD, I'm obligated to include him as a co-author.
 11:48:09 **9** Now with respect to Ms. Vallez --
 11:48:11 **10 Q.** Excuse me. Excuse me.
 11:48:12 **11** Figures 12 and 13, who are those other
 11:48:14 **12** people in the room?
 11:48:19 **13 A.** In Figure 12 I see two -- I see three people
 11:48:24 **14** -- actually I see four, I apologize. There is a -- I
 11:48:29 **15** see five.
 11:48:31 **16** On the -- Let's go from right to left.
 11:48:33 **17 Q.** Well let me ask it this way. I'm going to
 11:48:35 **18** try to be quick here. Are any of those five --
 11:48:38 **19** Are all those five people listed as authors?
 11:48:40 **20 A.** No.
 11:48:41 **21 Q.** Okay. Then let's go to Figure 13. Are all
 11:48:44 **22** the people in -- in Figure 13 listed as authors?
 11:48:47 **23 A.** They are not.
 11:48:48 **24 Q.** Okay. Let's move on.
 11:48:54 **25** MR. ASSAAD: Let's take a break, actually.
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11:48:57 **1** THE REPORTER: Off the record, please.
 11:48:58 **2** (Recess from 11:48 a.m. to 12:00 p.m.)
 12:00:29 **3** BY MR. ASSAAD:
 12:00:50 **4 Q.** I'd like to turn to -- Strike that.
 12:00:57 **5** MR. ASSAAD: Have to mark it first.
 12:00:58 **6** (Abraham Exhibit 6 marked for
 12:00:58 **7** identification.)
 12:00:58 **8** BY MR. ASSAAD:
 12:01:10 **9 Q.** What's been marked as Exhibit 6 is a CV that
 12:01:15 **10** was provided to us along with your expert report in
 12:01:19 **11** this case.
 12:01:22 **12** Can you please review it to let me know if
 12:01:24 **13** this is an up to date CV?
 12:01:28 **14 A.** It would have been up to date at the time it
 12:01:30 **15** was submitted. There may have been more publications,
 12:01:33 **16** for instance, that have occurred since then, but this
 12:01:37 **17** would have been up to date at the time it was
 12:01:39 **18** submitted.
 12:01:40 **19 Q.** And at the time it was submitted would this
 12:01:43 **20** be an accurate summary of all your publications?
 12:01:50 **21 A.** Yes. I -- I sure hope I have them all here.
 12:01:54 **22** But yes, at the time of this submission I would expect
 12:01:57 **23** that all my publications would be listed here.
 12:02:00 **24 Q.** All right. Have you yourself ever used a
 12:02:04 **25** supercomputer with respect to any of your
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12:02:06 **1** publications?
 12:02:07 **2 A.** Yes.
 12:02:08 **3 Q.** Which ones?
 12:02:24 **4 A.** So in the journal publication list which
 12:02:26 **5** goes up to 156, it would be items 154, I think 150,
 12:02:40 **6** 149, 148, and I think 146.
 12:02:51 **7 Q.** Any others?
 12:02:51 **8 A.** Not that I recall now.
 12:02:52 **9 Q.** So the last time you used a supercomputer
 12:02:55 **10** would have been 2004, for any of your publications?
 12:02:57 **11 A.** That's to my best recollection.
 12:02:59 **12 Q.** And what supercomputer did you use?
 12:03:01 **13 A.** It would have been a supercomputer at the
 12:03:05 **14** University of Minnesota Supercomputing Institute.
 12:03:08 **15 Q.** Okay. Do you know how many cores that
 12:03:10 **16** supercomputer had?
 12:03:11 **17 A.** No, I do not recall how many cores.
 12:03:11 **18 Q.** And was --
 12:03:14 **19** Was it dealing with CFD?
 12:03:15 **20 A.** Yes.
 12:03:16 **21 Q.** Do you know what code was used on the
 12:03:18 **22** supercomputer?
 12:03:19 **23 A.** Yes.
 12:03:20 **24 Q.** What code?
 12:03:21 **25 A.** ANSYS Fluent.
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12:03:22 **1** Q. Okay. On all of them?

12:03:26 **2** A. Yes.

12:03:30 **3** Q. Do any of your publications consist of a

12:03:40 **4** supercomputer -- Strike that.

12:03:43 **5** Any of your publications deal with any CFD

12:03:46 **6** modeling that you did with any other code besides

12:03:50 **7** ANSYS?

12:03:57 **8** A. I've used three different codes, and I've

12:04:00 **9** used my own code.

12:04:02 **10** Q. What are the three codes?

12:04:04 **11** A. Flotran, F-L-O-T-R-A-N --

12:04:15 **12** (Interruption by the reporter.)

12:04:15 **13** Q. And just to make things quicker, if she has

12:04:18 **14** trouble spelling anything she'll ask you later on, so

12:04:20 **15** you don't have to spell everything out.

12:04:22 **16** A. Thank you. Sorry.

12:04:23 **17** CFX, Fluent.

12:04:26 **18** Q. And CFX and Fluent now are owned by ANSYS;

12:04:29 **19** correct?

12:04:30 **20** A. Correct.

12:04:34 **21** Q. Have you ever used a non-commercially

12:04:37 **22** available code besides your own code?

12:04:41 **23** A. No.

12:04:43 **24** Q. What publication did you use your --

12:04:45 **25** A. Let me take that back.

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12:04:47 **1** Yes.

12:04:48 **2** Q. What code?

12:04:50 **3** A. I don't know the name of the code, but it

12:04:53 **4** was code written by a person named Suhas Patankar.

12:04:59 **5** Q. And when did you use that?

12:05:02 **6** A. During my doctoral studies.

12:05:04 **7** Q. And who is Suhas Patankar?

12:05:08 **8** A. He was the computational fluid dynamics

12:05:10 **9** professor.

12:05:11 **10** Q. At the University of Minnesota?

12:05:12 **11** A. Yes.

12:05:14 **12** Q. And so that would have been during your

12:05:18 **13** doctorate?

12:05:20 **14** A. Yes.

12:05:21 **15** Q. Which would have been prior to 2002.

12:05:25 **16** A. Yes.

12:05:25 **17** Q. Okay. Has --

12:05:28 **18** Did you publish anything with the use of

12:05:30 **19** that code?

12:05:31 **20** A. No.

12:05:32 **21** Q. Okay. So you just took it as part of a

12:05:36 **22** class.

12:05:37 **23** A. Yes.

12:05:38 **24** Q. Was that one semester or two semesters?

12:05:41 **25** A. Two. And it may have been quarters at that

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12:05:43 **1** time.

12:05:43 **2** Q. Okay. Two quarters?

12:05:45 **3** A. Or two semesters.

12:05:47 **4** Q. Okay. You mentioned that you have your own

12:05:59 **5** code; correct?

12:06:01 **6** A. No. I mentioned that I've used my own code.

12:06:04 **7** So I've written code for problems as well.

12:06:07 **8** Q. Okay. Have you written code for CFD?

12:06:10 **9** A. Yes.

12:06:11 **10** Q. And have you used that code in any of your

12:06:14 **11** publications?

12:06:16 **12** A. No.

12:06:17 **13** Q. When was the last time you used that code

12:06:18 **14** for anything?

12:06:28 **15** A. I don't recall. I would estimate a decade

12:06:30 **16** or longer ago.

12:06:32 **17** Q. Does that code still exist?

12:06:33 **18** A. No.

12:06:35 **19** Q. And was that code used on a supercomputer?

12:06:38 **20** A. No.

12:06:43 **21** Q. Do you know the process to have the ability

12:06:48 **22** to use a code on a supercomputer?

12:06:52 **23** A. Yes.

12:06:52 **24** Q. What is the process?

12:06:56 **25** A. I can tell you the process I used, which was

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12:06:59 **1** the process at Minnesota. Other institutes may have

12:07:03 **2** different processes.

12:07:04 **3** But I was a research fellow at the

12:07:06 **4** University of Minnesota in their Supercomputing

12:07:10 **5** Center, which means I had the latitude, I was allowed

12:07:13 **6** to submit jobs on their computers. And you would

12:07:17 **7** submit them -- It was all done remotely. You'd submit

12:07:21 **8** your jobs remotely and then the results would come

12:07:24 **9** back and then you would look at them.

12:07:25 **10** Q. I understand that.

12:07:26 **11** But do you know how --

12:07:27 **12** Do you know how many supercomputers there

12:07:29 **13** are in the United States?

12:07:31 **14** A. I do not know.

12:07:32 **15** Q. Do you know the process, for example, if you

12:07:34 **16** want to use the supercomputer in Illinois or down in

12:07:39 **17** Texas, the process to qualify your code to be used on

12:07:49 **18** the supercomputer?

12:07:50 **19** A. I do not.

12:07:51 **20** Q. Okay. Do you know what a petascale is?

12:08:02 **21** A. Yes.

12:08:02 **22** Q. What's a petascale?

12:08:04 **23** A. It is -- I --

12:08:07 **24** I think it's 10 to the 12, so a one with 12

12:08:12 **25** zeros.

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12:08:12 **1** Q. And do you know how that term is used in
 12:08:15 **2** supercomputing?
 12:08:19 **3** "Yes" or "no"?
 12:08:20 **4** A. It could be used in different forms. It
 12:08:21 **5** could be used by RAM, by hard drive storage, or by
 12:08:26 **6** computational quantity, so it's how many calculations
 12:08:29 **7** are carried out per second. So it could be used in
 12:08:31 **8** many different --
 12:08:33 **9** Q. Are you guessing, or do you know?
 12:08:34 **10** A. No. I'm --
 12:08:36 **11** It could be used in different terms. So,
 12:08:39 **12** for example, I could have a hard drive that is a
 12:08:45 **13** terabyte and a tera stands for a quantity. I could
 12:08:48 **14** have RAM, which is different from hard drive, which is
 12:08:51 **15** a gigabyte. Or I could have a processor which is a
 12:08:55 **16** gigahertz. So when you -- you're using peta as the
 12:08:57 **17** prefix, you have to apply that peta to something. So
 12:09:01 **18** if you say petahertz it means something, if you say
 12:09:05 **19** petagigs it means something else.
 12:09:07 **20** Q. Well I'm using the term petascale.
 12:09:09 **21** Do you know what petascale means?
 12:09:11 **22** A. I do, and I answered that. A petascale is a
 12:09:13 **23** numerical quantification, so like million, billion,
 12:09:16 **24** quadrillion.
 12:09:18 **25** Q. Of what?

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12:09:19 **1** A. Well, it depends. So, for example, a hard
 12:09:20 **2** drive would be --
 12:09:20 **3** Q. We're not --
 12:09:21 **4** We're not talking about hard drives here,
 12:09:23 **5** sir. We're talking about supercomputers.
 12:09:25 **6** MR. GOSS: You didn't let him finish his
 12:09:26 **7** answer.
 12:09:26 **8** Q. Well we're not talking about hard drives,
 12:09:28 **9** we're talking about supercomputers, so let's stick to
 12:09:28 **10** the question.
 12:09:30 **11** Do you know how the term petascale is used
 12:09:32 **12** in the supercomputing world?
 12:09:34 **13** A. I'm telling you it's used in different
 12:09:36 **14** contexts.
 12:09:37 **15** Q. Okay.
 12:09:37 **16** A. For example, in a supercomputer you may talk
 12:09:39 **17** about storage, RAM, or calculation speed.
 12:09:44 **18** Q. Do you know what the petascale is of the
 12:09:48 **19** University of Minnesota supercomputer?
 12:09:50 **20** A. I do not.
 12:09:51 **21** Q. Do you know what the petascale is of the
 12:09:53 **22** University of Texas supercomputer?
 12:09:55 **23** A. I do not.
 12:10:01 **24** Q. What code did you write your --
 12:10:04 **25** What type of language did you write your

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12:10:06 **1** code in?
 12:10:07 **2** A. Likely Fortran.
 12:10:10 **3** Q. Which Fortran?
 12:10:11 **4** A. Either 77 or 91.
 12:10:19 **5** Q. And to write code, such as in Fortran, you
 12:10:25 **6** have to understand and use the underlying equations,
 12:10:30 **7** for example, in fluid dynamics; correct?
 12:10:32 **8** A. Correct.
 12:10:41 **9** Q. Who is Dr. Sparrow?
 12:10:43 **10** A. He's a professor at the University of
 12:10:45 **11** Minnesota, and he's my formal -- former doctoral
 12:10:52 **12** advisor.
 12:10:52 **13** Q. Do you still communicate with him?
 12:10:54 **14** A. Occasionally.
 12:10:55 **15** Q. When you say "occasionally," how often is
 12:10:57 **16** occasionally?
 12:10:58 **17** A. Perhaps once a month.
 12:11:01 **18** Q. What about Dr. Minkowycz; do you know who he
 12:11:05 **19** is?
 12:11:06 **20** A. Yes, I do.
 12:11:07 **21** Q. Who's he?
 12:11:07 **22** A. He's a professor at the University of
 12:11:09 **23** Illinois, Chicago.
 12:11:11 **24** Q. Was he ever at the University of Minnesota?
 12:11:15 **25** A. I believe he did his doctoral work at the

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12:11:17 **1** University of Minnesota.
 12:11:18 **2** Q. Do you know him?
 12:11:19 **3** A. I have met him once, but we've communicated
 12:11:23 **4** by email.
 12:11:24 **5** Q. How often do you communicate with him?
 12:11:26 **6** A. It depends. Maybe once every three months.
 12:11:35 **7** Q. And you've communicated with him a lot in
 12:11:37 **8** the past; correct?
 12:11:39 **9** MR. GOSS: Object to form.
 12:11:40 **10** A. I don't know what "a lot" is. I -- I would
 12:11:42 **11** say I communicate with him once every three months I'd
 12:11:45 **12** guess.
 12:11:46 **13** Q. I mean you've known him since at least 2009;
 12:11:54 **14** correct?
 12:11:54 **15** A. Yes.
 12:11:59 **16** Q. And he is the editor-in-chief of *Numerical*
 12:12:02 **17** *Heat Transfer*; correct?
 12:12:03 **18** A. That is correct.
 12:12:03 **19** Q. Do you know how long he's been the
 12:12:05 **20** editor-in-chief?
 12:12:06 **21** A. I do not know.
 12:12:07 **22** Q. And Dr. Sparrow is the chairman of the -- of
 12:12:15 **23** the editors for *Numerical Heat Transfer*; correct?
 12:12:19 **24** A. That may be true.
 12:12:24 **25** Q. Chairman of the Editorial Advisory Board.

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12:12:26 **1** A. That may be true.
 12:12:29 **2** Q. Okay. And you guys are friends, correct,
 12:12:33 **3** with Dr. Sparrow?
 12:12:34 **4** A. Yes, I would call Dr. Sparrow a friend.
 12:12:36 **5** Q. Would you call Dr. Minkowycz a friend?
 12:12:39 **6** A. I'm...
 12:12:40 **7** Boy, I don't know. Perhaps. I don't know.
 12:12:51 **8** Q. You published a lot with Dr. Minkowycz and
 12:12:53 **9** Dr. Sparrow; correct?
 12:12:54 **10** A. Yes, I have.
 12:12:55 **11** Q. And in fact if we go to your publications,
 12:13:02 **12** we could start off with your books, and in 2011 you
 12:13:07 **13** authored a book with Dr. Sparrow and Dr. Minkowycz;
 12:13:10 **14** correct?
 12:13:18 **15** A. Yes.
 12:13:19 **16** Q. And if you look at "Book Chapters," you
 12:13:21 **17** authored one, two, three, four, four book chapters
 12:13:29 **18** with Dr. Minkowycz; correct?
 12:13:31 **19** A. That is correct.
 12:13:34 **20** Q. Between 2011 and the present; correct?
 12:13:38 **21** A. Correct.
 12:13:39 **22** Q. And you authored one, two, three, four, five
 12:13:45 **23** book chapters with Dr. Sparrow; correct?
 12:13:48 **24** A. Correct.
 12:13:48 **25** Q. Between 2005 and 2017; correct?

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12:13:51 **1** A. Correct.
 12:13:56 **2** Q. Now with "Publications," if you look at
 12:13:58 **3** number 10, you authored an article with Dr. Sparrow
 12:14:01 **4** and Dr. Minkowycz in 2017.
 12:14:04 **5** A. That is correct.
 12:14:06 **6** Q. And if you look at number 17, you authored
 12:14:08 **7** another article with Dr. Minkowycz and Dr. Sparrow
 12:14:10 **8** again in 2017.
 12:14:12 **9** A. Which number are you mentioning?
 12:14:14 **10** Q. 17.
 12:14:15 **11** A. That is correct.
 12:14:17 **12** Q. And if you look at number 22, you authored
 12:14:22 **13** another article in 2016 with Dr. Minkowycz and Dr.
 12:14:26 **14** Sparrow.
 12:14:26 **15** A. Correct.
 12:14:27 **16** Q. And that was in *Numerical Heat Transfer*;
 12:14:30 **17** correct?
 12:14:30 **18** A. Correct.
 12:14:30 **19** Q. And that's *Numerical Heat Transfer B*.
 12:14:33 **20** A. Correct.
 12:14:34 **21** Q. Is Dr. Minkowycz the editor-in-chief of
 12:14:39 **22** *Numerical Heat Transfer B*?
 12:14:42 **23** A. Yes.
 12:14:47 **24** Q. On number 23 of your publications you
 12:14:49 **25** authored an article with Dr. Sparrow in 2016; correct?

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12:14:53 **1** A. Correct.
 12:14:56 **2** Q. Turning to the next page.
 12:14:58 **3** Number 29 you have another article with Dr.
 12:15:01 **4** Minkowycz and Dr. Sparrow in 2016; correct?
 12:15:04 **5** A. Correct.
 12:15:05 **6** Q. And I assume that when you write articles
 12:15:08 **7** together you have communications with each other.
 12:15:11 **8** A. Yes.
 12:15:12 **9** Q. And probably numerous communications
 12:15:14 **10** regarding the article.
 12:15:15 **11** A. Not necessarily.
 12:15:20 **12** Q. Would you have more than one communication?
 12:15:22 **13** A. Likely.
 12:15:28 **14** Q. How did you and Dr. Minkowycz begin to start
 12:15:32 **15** publishing together?
 12:15:34 **16** A. Well he's one of the best in the field. I
 12:15:37 **17** mean, in this area of *numerical heat transfer* he may
 12:15:41 **18** be the best. And that's reflected by his position in
 12:15:45 **19** industry. He's the editor-in-chief of, as you pointed
 12:15:48 **20** out, *Numerical Heat Transfer*, which is the top
 12:15:51 **21** *numerical heat transfer* journal. He's also the
 12:15:53 **22** editor-in-chief of *International Journal of Heat Mass*
 12:15:57 **23** *Transfer*, which is the top journal in that field. And
 12:15:59 **24** he's also the editor-in-chief of *International*
 12:16:03 **25** *Communications in Heat Mass Transfer*. So it is only

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12:16:07 **1** -- I guess I -- it's expected you would work with the
 12:16:10 **2** best, so that's how.
 12:16:12 **3** MR. ASSAAD: Move to strike.
 12:16:13 **4** Counsel, can you please instruct your
 12:16:15 **5** witness to answer my questions? I did not ask -- I
 12:16:17 **6** didn't ask how well known or how good Dr. Minkowycz
 12:16:20 **7** is.
 12:16:20 **8** Q. I asked: How did you become involved in
 12:16:23 **9** publishing with Dr. Minkowycz?
 12:16:25 **10** A. Because we work in similar fields on similar
 12:16:26 **11** problems.
 12:16:27 **12** Q. At what point in time were you first
 12:16:28 **13** introduced to Dr. Minkowycz?
 12:16:30 **14** A. I would go back to my reference list and I'd
 12:16:32 **15** find the earliest one. If you would like me to do
 12:16:34 **16** that, I can do it.
 12:16:35 **17** Q. So it would go from your early --
 12:16:37 **18** So the first time you started doing work
 12:16:44 **19** with Dr. Minkowycz was probably about the time of your
 12:16:47 **20** first publication with him?
 12:16:49 **21** A. Yes.
 12:16:49 **22** Q. Who introduced you to Dr. Minkowycz?
 12:16:51 **23** A. It would have been Dr. Sparrow.
 12:16:54 **24** Q. Are Dr. Sparrow and Dr. Minkowycz good
 12:16:56 **25** friends?

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12:16:58 **1** A. I think they are.

12:17:03 **2** Q. Number 35 you have a journal article talking

12:17:16 **3** about patient-warming blankets that was published in

12:17:20 **4** *Numerical Heat Transfer A?*

12:17:21 **5** A. Yes.

12:17:22 **6** Q. And you did that with Ms. Vallez and Mr.

12:17:26 **7** Plourde; correct?

12:17:27 **8** A. Correct.

12:17:29 **9** Q. Was that peer reviewed?

12:17:30 **10** A. Yes.

12:17:31 **11** Q. Do you recall whether or not there were any

12:17:33 **12** comments from the editors in that article?

12:17:34 **13** A. I don't recall.

12:17:36 **14** Q. You have received, in the past, comments

12:17:37 **15** from reviewers; correct?

12:17:39 **16** A. Yes.

12:17:40 **17** Q. Whether they want to make changes or have

12:17:42 **18** questions; correct?

12:17:44 **19** A. Yes.

12:17:45 **20** Q. Or any type of comments; correct?

12:17:47 **21** A. Correct.

12:17:48 **22** Q. That's usually how this occurs with peer

12:17:50 **23** review, they review it and offer comments; correct?

12:17:52 **24** A. Correct.

12:17:52 **25** Q. And most of the time you do receive comments

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12:17:54 **1** from reviewers; correct?

12:17:55 **2** MR. GOSS: Object to form.

12:17:57 **3** A. I don't know if it's most of the time. I

12:17:59 **4** mean, I haven't counted. Sometimes papers are

12:18:01 **5** accepted as is, sometimes papers are rejected, and

12:18:04 **6** sometimes papers are commented on.

12:18:09 **7** Q. You've been a reviewer; correct?

12:18:10 **8** A. Yes.

12:18:11 **9** Q. Do you usually --

12:18:13 **10** Or do you regularly provide comments to what

12:18:14 **11** you review?

12:18:16 **12** A. Yes, I regularly provide comments.

12:18:20 **13** Q. Whether it was, this is a fascinating paper,

12:18:22 **14** or an interesting paper, or if you have questions;

12:18:24 **15** correct?

12:18:26 **16** A. I would say I regularly provide comments. I

12:18:28 **17** don't know if I've ever written this is a fascinating

12:18:30 **18** paper or an interesting paper, but I would say I

12:18:33 **19** regularly provide comments.

12:18:34 **20** Q. And when you are asked to review a paper,

12:18:37 **21** you actually review the paper and read it; correct?

12:18:39 **22** A. I tend to review very thoroughly. So yes, I

12:18:42 **23** do review papers.

12:18:43 **24** Q. Okay. What percentage of papers that you

12:18:52 **25** review that you provide no comments? And an estimate

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12:18:57 **1** is okay.

12:19:01 **2** A. Maybe twenty percent.

12:19:07 **3** Q. Okay. Now number 38 you published with Dr.

12:19:14 **4** Sparrow again in 2015.

12:19:17 **5** A. Yes.

12:19:18 **6** Q. And in 20 --

12:19:20 **7** And number 45 you published with Dr.

12:19:22 **8** Minkowycz in 2015.

12:19:23 **9** A. Correct.

12:19:27 **10** Q. And you would agree with me that you publish

12:19:34 **11** regularly with Dr. Sparrow and Dr. Minkowycz.

12:19:37 **12** A. Yes.

12:19:48 **13** Q. And number 46 you published with Dr. Sparrow

12:19:50 **14** in 2015; correct?

12:19:53 **15** A. That is correct.

12:19:54 **16** Q. And number 47 you also published with Dr.

12:19:57 **17** Sparrow in 2015.

12:20:02 **18** A. Correct.

12:20:03 **19** Q. And number 52 you published with Dr.

12:20:07 **20** Minkowycz in 2015.

12:20:08 **21** A. Correct.

12:20:12 **22** Q. And in number 60, in 2014, you published

12:20:14 **23** with Dr. Minkowycz.

12:20:16 **24** A. Correct.

12:20:34 **25** Q. So between 2014 and the present you

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12:20:41 **1** published with Dr. Minkowycz seven publications and

12:20:59 **2** three book chapters; is that correct?

12:21:02 **3** That sound about right?

12:21:03 **4** A. Yes, it does.

12:21:04 **5** Q. And you've published more with Dr. Sparrow

12:21:07 **6** than Dr. Minkowycz in that period of time.

12:21:09 **7** A. That is correct.

12:21:57 **8** Q. You mentioned that when you are a peer

12:21:59 **9** reviewer you are very thorough when you review an

12:22:05 **10** article.

12:22:06 **11** A. Yes.

12:22:06 **12** Q. What did you mean by that?

12:22:08 **13** A. I read the articles thoroughly.

12:22:10 **14** Q. And do you read it right when you get it

12:22:12 **15** thoroughly, or do you have time?

12:22:13 **16** A. I try to read them right away, because

12:22:17 **17** authors -- sometimes a paper can languish in review

12:22:22 **18** and it's not fair to the authors, so I try to do it

12:22:25 **19** within a few days.

12:22:28 **20** Q. And do you know why you're picked, like how

12:22:31 **21** you get chosen for each paper that you review?

12:22:33 **22** A. Yes.

12:22:34 **23** Q. What's the process?

12:22:36 **24** A. Typically the process is I'm deemed an

12:22:39 **25** expert in that area, someone who is able to review a

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12:22:44 **1** paper.

12:22:45 **2** **Q.** And that's the editor-in-chief that decides

12:22:47 **3** who reviews?

12:22:49 **4** **A.** It may be. It may be an associate editor.

12:22:53 **5** **Q.** But it's someone on the editorial board.

12:22:55 **6** **A.** Typically that's how it works. And

12:22:59 **7** sometimes an editor does the review, so I edit books,

12:23:04 **8** and in that case I review.

12:23:48 **9** **Q.** Just for the record, Exhibit Number 3 is

12:23:50 **10** your peer-reviewed published report in this case;

12:23:52 **11** correct?

12:23:56 **12** **MR. GOSS:** Object to form.

12:23:58 **13** **MR. ASSAAD:** Basis?

12:24:00 **14** **MR. GOSS:** Well it's not identical to his

12:24:02 **15** report.

12:24:03 **16** **MR. ASSAAD:** My fault.

12:24:04 **17** **Q.** Exhibit 3 is your peer-reviewed publication

12:24:08 **18** that was published in *Numerical Heat Transfer*.

12:24:09 **19** **A.** Yes.

12:24:11 **20** **Q.** Okay. And that was submitted to *Numerical*

12:24:15 **21** *Heat Transfer* on May 4th, 2017; correct?

12:24:19 **22** **A.** I believe that's true.

12:24:20 **23** **Q.** Okay. Even though it says on the article

12:24:27 **24** that it was received on April 24th, 2017.

12:24:33 **25** **A.** I would defer to this -- the article

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12:24:37 **1** statement then, the April 24th.

12:24:39 **2** **Q.** And the article also says that it was

12:24:41 **3** accepted on June 16th, 2017; correct?

12:24:43 **4** **A.** Yes.

12:24:44 **5** **Q.** But it was actually accepted on May 31st,

12:24:46 **6** 2017; correct?

12:24:48 **7** **A.** I don't know. All I can see is that it's

12:24:52 **8** listed here as accepted June 16th.

12:24:57 **9** (Abraham Exhibit 7 marked for

12:24:57 **10** identification.)

12:24:57 **11** BY MR. ASSAAD:

12:25:09 **12** **Q.** Do you recognize Exhibit 7?

12:25:10 **13** **A.** Yes, I do.

12:25:12 **14** **Q.** Exhibit 7 is your acceptance letter from Dr.

12:25:16 **15** Minkowycz with respect to the acceptance of the

12:25:20 **16** article which is Exhibit 3; correct?

12:25:24 **17** **A.** It is, but what it says here is "...I intend

12:25:27 **18** to accept your work for publication." So this is a

12:25:30 **19** statement on May 31st saying I intend to accept your

12:25:34 **20** work for publication, but it's not the final

12:25:38 **21** acceptance.

12:25:57 **22** **Q.** You're talking about the first line of

12:25:58 **23** paragraph two; correct?

12:26:00 **24** **A.** Yes, I am.

12:26:02 **25** **Q.** And that's after the line from paragraph one

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12:26:04 **1** that says, "Indeed the quality standard of the paper

12:26:06 **2** merits its acceptance for publication..."

12:26:08 **3** **A.** Yes.

12:26:09 **4** **Q.** And if you go to page 2 of Exhibit 7, this

12:26:21 **5** is a form that was filled out by Dr. Minkowycz;

12:26:24 **6** correct?

12:26:25 **7** **A.** I don't know who filled out this form.

12:26:26 **8** **Q.** Did you fill out this form?

12:26:28 **9** **A.** I did not fill out this form.

12:26:30 **10** **Q.** And this was attached to the letter;

12:26:32 **11** correct?

12:26:34 **12** **A.** I don't recall if it was attached to the

12:26:35 **13** letter. It may have been.

12:26:37 **14** **Q.** Well I represent to you that this entire

12:26:41 **15** document came as one PDF from -- from defense counsel.

12:26:45 **16** Is there any reason for you to believe that it's not

12:26:47 **17** one document that's together?

12:26:49 **18** **A.** No. There's no reason for me to believe

12:26:51 **19** it's not one document.

12:26:52 **20** **Q.** Okay. And pages 3 and 4 discuss the final

12:26:55 **21** checklist, talking about the processing of

12:27:00 **22** manuscripts; correct?

12:27:02 **23** **A.** Yes.

12:27:05 **24** **Q.** And that's for publication; correct?

12:27:07 **25** **A.** Yes.

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12:27:11 **1** **Q.** So you agree with me that based on Exhibit

12:27:13 **2** Number 7, the transcript was received by *Numerical*

12:27:18 **3** *Heat Transfer* on May 4th, 2017.

12:27:20 **4** **A.** I disagree.

12:27:23 **5** **Q.** It says manuscripts -- manuscript date

12:27:25 **6** details, date manuscript received, it says May 4th,

12:27:30 **7** 2007. Is that what it says there?

12:27:32 **8** **A.** That's --

12:27:32 **9** **MR. GOSS:** 2017; correct?

12:27:34 **10** **MR. ASSAAD:** 2017.

12:27:34 **11** **A.** That is what --

12:27:35 **12** That is the date entered on this form.

12:27:38 **13** **Q.** Okay.

12:27:39 **14** **A.** May 4th, 2017.

12:27:41 **15** But it's not the acceptance -- it's not the

12:27:43 **16** reception date of April 24th.

12:27:50 **17** **Q.** Well you agree that it says May 4th, 2017 on

12:27:56 **18** this form that was filled out by *Numerical Heat*

12:27:58 **19** *Transfer*.

12:27:59 **20** **A.** I agree that's what the form says.

12:28:16 **21** **Q.** And you'll agree that by May 31st, 2017 Dr.

12:28:22 **22** Minkowycz accepted your paper.

12:28:23 **23** **A.** I would agree to what's written in the

12:28:25 **24** letter, which says he intends to accept it. But the

12:28:29 **25** final article was accepted June 16th.

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12:28:32 **1** Q. Do you have any documentation to show that
 12:28:33 **2** it was accepted June 16th?
 12:28:35 **3** A. Yes.
 12:28:35 **4** Q. Where?
 12:28:36 **5** A. It's on this journal paper.
 12:28:38 **6** Q. Not talking on the journal paper. I'm
 12:28:39 **7** talking about a letter from...
 12:28:44 **8** A. Well this -- the metadata contained here
 12:28:47 **9** reflects the reception and acceptance dates, so --
 12:28:52 **10** Q. Well which one's correct, sir?
 12:28:55 **11** A. I think they're both correct.
 12:28:56 **12** Q. So the transcript was received both on -- or
 12:29:00 **13** the manuscript was received both on June 16th, 2017,
 12:29:04 **14** and May 4th, 2017?
 12:29:06 **15** MR. GOSS: Object to form.
 12:29:08 **16** A. I think there's some confusion. When a
 12:29:11 **17** document is sent in, that's the reception date. So as
 12:29:15 **18** I look at this that would have been April 24th.
 12:29:19 **19** Now according to this paper it was received
 12:29:24 **20** by the editor-in-chief on May 4th. So those aren't
 12:29:33 **21** discongruent facts, those are coherent facts. It goes
 12:29:35 **22** to the journal and then it goes to the
 12:29:37 **23** editor-in-chief.
 12:29:37 **24** Q. What evidence do you have that you submitted
 12:29:39 **25** your paper on April -- April 24th, 2017? Besides
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12:29:45 **1** Exhibit Number 3.
 12:29:45 **2** A. I don't. I could look at the creation file
 12:29:50 **3** that I sent, but I don't know -- sitting here right
 12:29:55 **4** now, I don't have that.
 12:29:57 **5** Q. You agree with me that between May 4th, 2017
 12:30:02 **6** and May 31st, 2017 there's only approximately 19
 12:30:07 **7** business days?
 12:30:14 **8** A. Say -- could you say that -- ask that again?
 12:30:15 **9** Q. Between May 4th, 2017 and May 31st 2017
 12:30:19 **10** there's only approximately 19 business days.
 12:30:22 **11** A. I would agree.
 12:30:41 **12** (Abraham Exhibit 8 marked for
 12:30:41 **13** identification.)
 12:30:41 **14** BY MR. ASSAAD:
 12:30:54 **15** Q. What is Exhibit 8?
 12:30:56 **16** A. Exhibit 8 is a cover letter.
 12:31:00 **17** Q. Is there a date on this cover letter?
 12:31:01 **18** A. There is not a date.
 12:31:03 **19** Q. Is this the cover letter that was attached
 12:31:06 **20** to your manuscript that you submitted to *Numerical*
 12:31:12 **21** *Heat Transfer*?
 12:31:13 **22** A. Yes.
 12:31:15 **23** Q. If I want to find the date of this cover
 12:31:16 **24** letter, how would I find it?
 12:31:19 **25** A. Perhaps going to the metadata of the file.
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12:31:23 **1** Q. Do you still have that file?
 12:31:24 **2** A. I believe I do.
 12:31:42 **3** Q. You agree with me, because of your
 12:31:44 **4** relationship with Dr. Minkowycz, that there'd be a
 12:31:48 **5** conflict of interest for him to peer review your
 12:31:50 **6** article.
 12:31:50 **7** A. I disagree.
 12:32:13 **8** Q. Do you know whether or not the publisher,
 12:32:16 **9** Taylor & Francis, would consider that a conflict of
 12:32:19 **10** interest?
 12:32:20 **11** A. I don't believe they would.
 12:32:21 **12** Q. Now you agree with me that there's nowhere
 12:32:29 **13** in the acceptan -- in this letter of Exhibit 7 in
 12:32:38 **14** which there's any indication that this article was
 12:32:45 **15** peer reviewed.
 12:32:48 **16** A. Which exhibit?
 12:32:50 **17** Q. Seven.
 12:32:51 **18** MR. GOSS: Seven.
 12:32:55 **19** A. I disagree.
 12:32:56 **20** Q. Where does it say it was peer reviewed?
 12:32:58 **21** A. In the first paragraph.
 12:32:59 **22** Q. It says, "I have reviewed the paper" -- and
 12:33:01 **23** "I," would you agree with me, would be Dr. Minkowycz?
 12:33:05 **24** A. Yes.
 12:33:06 **25** Q. It says, "I have reviewed the paper
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12:33:07 **1** carefully and find it to be of good quality." Is that
 12:33:09 **2** what it states?
 12:33:10 **3** A. Yes, it does.
 12:33:11 **4** Q. "Indeed, the quality standard of the paper
 12:33:13 **5** merits its acceptance for publication without further
 12:33:16 **6** review."
 12:33:16 **7** Did I read that correctly?
 12:33:17 **8** A. Yes, you did.
 12:33:18 **9** Q. So as of May 31st, 2017 there is no
 12:33:24 **10** indication in this letter that this paper has been
 12:33:28 **11** reviewed by any peer reviewers; correct?
 12:33:30 **12** MR. GOSS: Object to form.
 12:33:31 **13** A. Incorrect.
 12:33:32 **14** Q. Where does it --
 12:33:33 **15** Where is the term "peer" or "referee" or
 12:33:37 **16** "reviewer" in this -- in Exhibit 7?
 12:33:41 **17** A. It's the word "I." Editors-in-chief have
 12:33:44 **18** the prerogative to review papers. In fact I am an
 12:33:48 **19** editor on many publications and I routinely do the
 12:33:51 **20** review myself.
 12:33:52 **21** Q. So it's your opinion that the re -- the peer
 12:33:55 **22** review was done by Dr. Minkowycz?
 12:33:57 **23** A. According to this letter he says "I have
 12:33:59 **24** reviewed." Now it may have gone out to other people
 12:34:03 **25** as well, maybe he accepted it before he got reviews
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12:34:06 **1** back. Maybe it didn't go out to anyone, maybe he did
 12:34:08 **2** the review. But that's the prerogative and the
 12:34:11 **3** practice of editors-in-chief.
 12:34:13 **4** **Q.** Okay. So it's your understanding --
 12:34:15 **5** Well you agree with me that at this point in
 12:34:18 **6** time, today, the only person that we're aware of that
 12:34:23 **7** reviewed your publication, Exhibit Number 3, is Dr.
 12:34:27 **8** Minkowicz.
 12:34:28 **9** MR. GOSS: Before it was published.
 12:34:30 **10** **Q.** Before it was published.
 12:34:31 **11** **A.** Correct.
 12:34:31 **12** **Q.** Okay. You agree with me that there's no
 12:34:34 **13** indication in Exhibit 7 that your publication was
 12:34:42 **14** reviewed by anyone other than Dr. Minkowicz.
 12:34:47 **15** MR. GOSS: Before it was published.
 12:34:49 **16** **Q.** Before it was published.
 12:34:50 **17** **A.** I agree.
 12:34:54 **18** **Q.** And *Numerical Heat Transfer* is a journal
 12:35:00 **19** that does not rely on post-publication review;
 12:35:03 **20** correct?
 12:35:05 **21** **A.** I don't know that.
 12:35:06 **22** **Q.** Okay. So it's your opinion that as long as
 12:35:13 **23** Dr. Minkowicz reviewed your paper that would make
 12:35:16 **24** this paper a peer-reviewed paper according to the
 12:35:20 **25** guidelines of the *Numerical Heat Transfer* journal.
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12:37:01 **1** **A.** Yes.
 12:37:02 **2** **Q.** Have you seen this document before?
 12:37:04 **3** **A.** No.
 12:37:06 **4** **Q.** And I represent to you that I have taken
 12:37:08 **5** this off the Taylor & Francis website on -- yesterday,
 12:37:16 **6** or -- yes, yesterday, Valentine's Day, February 14th,
 12:37:19 **7** 2018.
 12:37:21 **8** Do you see where it says "Peer review"?
 12:37:23 **9** **A.** Yes.
 12:37:24 **10** **Q.** It states: "Taylor & Francis is committed
 12:37:26 **11** to peer-review integrity and upholding the highest
 12:37:29 **12** standards of review. Once your paper has been
 12:37:32 **13** assessed for suitability by the editor, it will then
 12:37:35 **14** be double blind peer-reviewed by expert referees."
 12:37:39 **15** Did I read that correctly?
 12:37:40 **16** **A.** Yes.
 12:37:40 **17** **Q.** You understand what it means to be assessed
 12:37:42 **18** for suitability by the editor?
 12:37:44 **19** **A.** Yes.
 12:37:45 **20** **Q.** That means --
 12:37:46 **21** You agree with me that means that the paper,
 12:37:48 **22** the subject matter of the paper is the type of
 12:37:52 **23** scientific areas that this paper -- that the journal
 12:37:54 **24** usually publishes.
 12:37:55 **25** **A.** That is typically the meaning.
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12:35:24 **1** **A.** I don't know the guidelines of the *Numerical*
 12:35:28 **2** *Heat Transfer* journal, but what I'll tell you is the
 12:35:29 **3** practice is editors-in-chief have the prerogative to
 12:35:33 **4** do reviews.
 12:35:33 **5** **Q.** I'm not asking about in general. I'm
 12:35:35 **6** talking about what is required by *Numerical Heat*
 12:35:38 **7** *Transfer*. Do you know one way or the other?
 12:35:39 **8** **A.** I do not know.
 12:35:40 **9** **Q.** Okay. Would you be surprised that
 12:35:44 **10** editors-in-chief are not allowed to publish papers
 12:35:48 **11** without them being peer reviewed in *Numerical Heat*
 12:35:50 **12** *Transfer*?
 12:35:51 **13** **A.** I don't know one way or the other.
 12:36:12 **14** **Q.** And I think I asked you this before, but you
 12:36:15 **15** know what a double-blind peer review is; correct?
 12:36:17 **16** **A.** Yes, I do.
 12:36:18 **17** **Q.** It's where the author and the reviewers do
 12:36:20 **18** not know who each other are.
 12:36:21 **19** **A.** That is correct.
 12:36:24 **20** (Abraham Exhibit 9 marked for
 12:36:24 **21** identification.)
 12:36:24 **22** BY MR. ASSAAD:
 12:36:52 **23** **Q.** Exhibit 9 is the "Instructions for authors"
 12:36:56 **24** for *Numerical Heat Transfer, Part A: Applications*. Do
 12:37:01 **25** you agree with that?
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12:37:59 **1** **Q.** So according to this document, you agree
 12:38:02 **2** with me that *Numerical Heat Transfer, Part A:*
 12:38:06 **3** *Applications* con -- the peer-review process consists
 12:38:09 **4** of a double-blind peer-review process.
 12:38:11 **5** **A.** That's what this document states.
 12:38:37 **6** **Q.** And it's your opinion -- Strike that.
 12:38:42 **7** Did you have any conversations with Dr.
 12:38:48 **8** Minkowicz, email, phone, with respect to this paper?
 12:38:52 **9** **A.** Yes.
 12:38:53 **10** **Q.** When?
 12:38:54 **11** **A.** It would have been before it was submitted.
 12:38:57 **12** **Q.** And do you have email correspondence with
 12:38:59 **13** him?
 12:38:59 **14** **A.** No.
 12:39:00 **15** **Q.** It was a phone conversation?
 12:39:01 **16** **A.** Yes.
 12:39:02 **17** **Q.** How many?
 12:39:02 **18** **A.** One.
 12:39:03 **19** **Q.** Tell me about it.
 12:39:03 **20** **A.** I asked him which --
 12:39:05 **21** I told him that I was preparing a
 12:39:08 **22** calculation of airflow, and I wanted to know what
 12:39:12 **23** journal he thought it would be best suited for.
 12:39:26 **24** **Q.** Did you tell him that you were a litigation
 12:39:28 **25** consultant with respect to the -- and that was the
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12:39:31 **1** reason why you got the research to do this CFD
 12:39:35 **2** calculation?
 12:39:37 **3** MR. GOSS: Object to form.
 12:39:39 **4** **A.** I think you're conflating the study, the
 12:39:43 **5** grant study and the litigation consultancy. I was
 12:39:47 **6** hired by 3M to do an academic study, and that work was
 12:39:52 **7** published and the funding was disclosed. So I told
 12:39:55 **8** him that. I did not mention anything of a litigation.
 12:40:52 **9** **Q.** And it's your opinion that there's no
 12:40:59 **10** conflict of interest for Dr. Minkowycz to review your
 12:41:03 **11** paper?
 12:41:04 **12** **A.** Yes, because we have no conflicts. We have
 12:41:07 **13** no financial relationship at all. The fact I have
 12:41:13 **14** published with him can't be considered a conflict
 12:41:15 **15** because I publish with almost everyone. And I publish
 12:41:18 **16** with many editors, many editors-in-chief. The fact
 12:41:22 **17** is, I wanted this to go to the top journal, a journal
 12:41:26 **18** that was best suited for the study, and he happens to
 12:41:28 **19** be the editor-in-chief there. I didn't prejudice my
 12:41:32 **20** study in any way by telling him that it was involved
 12:41:36 **21** in a litigation, but I did disclose funding from 3M
 12:41:40 **22** for the academic part of the work.
 12:41:42 **23** **Q.** So the answer to my question is you don't
 12:41:44 **24** believe it's a conflict of interest for Dr. Minkowycz
 12:41:46 **25** to review your paper.

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12:41:47 **1** **A.** I do not.
 12:41:48 **2** **Q.** Okay.
 12:41:50 **3** (Abraham Exhibit 10 marked for
 12:41:50 **4** identification.)
 12:41:50 **5** BY MR. ASSAAD:
 12:42:10 **6** **Q.** Exhibit Number 10 is another article from
 12:42:14 **7** Taylor & Francis, who's the publisher of *Numerical*
 12:42:18 **8** *Heat Transfer*, Applications A, titled "Ethical
 12:42:21 **9** considerations when assigning independent reviewers."
 12:42:24 **10** Under "Reviewer bias and conflicts of
 12:42:28 **11** interest" it states: "To ensure a fair review is
 12:42:31 **12** carried out, potential reviewers should be reviewed to
 12:42:34 **13** identify the possibility of any conflicts of interest
 12:42:38 **14** which may lead to bias. For example, a reviewer's
 12:42:43 **15** author history and institution should be observed to
 12:42:46 **16** discover whether they have been a recent collaborator
 12:42:50 **17** with, or worked at the same organization as, the
 12:42:53 **18** author."
 12:42:54 **19** You would agree with me that you and Dr.
 12:42:58 **20** Minkowycz have been collaborators in articles over
 12:43:02 **21** the past three years.
 12:43:03 **22** **A.** I would agree to that statement.
 12:43:05 **23** **Q.** "Preferably, the reviewer should not have
 12:43:08 **24** worked with the author in the last three years."
 12:43:11 **25** Did I read that correctly?

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12:43:12 **1** **A.** Yes.
 12:43:13 **2** **Q.** You have worked with Dr. Minkowycz in the
 12:43:14 **3** last three years; correct?
 12:43:16 **4** **A.** Correct.
 12:43:21 **5** **Q.** "However, if they have recently collaborated
 12:43:23 **6** with the author or share the same affiliation, this
 12:43:27 **7** may constitute a potential conflict of interest, and
 12:43:30 **8** subsequently result in a biased review."
 12:43:32 **9** Did I read that correctly?
 12:43:32 **10** **A.** You read that correctly.
 12:43:55 **11** MR. ASSAAD: Let's go to lunch.
 12:43:58 **12** THE REPORTER: Off the record, please.
 12:44:00 **13** (Luncheon recess taken at
14 approximately 12:44 p.m.)
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1 AFTERNOON SESSION
2 (Deposition reconvened at
3 approximately 1:32 p.m.)
4 BY MR. ASSAAD:
 13:32:53 **5** **Q.** Just so the jury would understand, how do
 13:32:56 **6** you define "divergence"?
 13:33:07 **7** **A.** Divergence is often when your results reach
 13:33:15 **8** unrealistic magnitudes, or change in ways that are
 13:33:20 **9** unphysical.
 13:33:25 **10** **Q.** And how would you define "convergence"?
 13:33:29 **11** **A.** When your results give the -- essentially
 13:33:33 **12** the same results, when they converge to a single
 13:33:37 **13** answer.
 13:34:09 **14** **Q.** Now in your report in this case on the 505
 13:34:12 **15** you used ANSYS; correct?
 13:34:14 **16** **A.** Correct.
 13:34:15 **17** **Q.** Okay. Do you recall what version?
 13:34:20 **18** **A.** I think it was 17.1.
 13:34:22 **19** **Q.** Okay. And you used a Large-Eddy Simulation;
 13:34:26 **20** correct?
 13:34:27 **21** **A.** Correct.
 13:34:28 **22** **Q.** Okay. And what equations do the Large-Eddy
 13:34:34 **23** Simulation utilize?
 13:34:36 **24** **A.** They utilize what's called the Navier-Stokes
 13:34:40 **25** equations.

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13:34:43 **1** Q. And is there a certain form of the
 13:34:46 **2** Navier-Stokes equations that they use?
 13:34:48 **3** A. No.
 13:34:50 **4** Q. So it's your understanding that LES uses
 13:34:53 **5** Navier-Stokes equations.
 13:34:54 **6** A. Yes.
 13:34:55 **7** Q. Okay. Is that the equations that were used
 13:35:10 **8** in the 505 analysis?
 13:35:12 **9** A. Yes.
 13:35:20 **10** Q. Now I'm looking at your --
 13:35:24 **11** Can you go to your report, Exhibit Number --
 13:35:28 **12** your Gareis report. You agree with me that in the
 13:35:34 **13** Gareis report there are no identification of any
 13:35:37 **14** equations; correct?
 13:35:43 **15** A. I disagree.
 13:35:46 **16** Q. Okay. Where are the --
 13:35:47 **17** Where are the Navier-Stokes equations in the
 13:35:49 **18** Gareis report?
 13:35:54 **19** A. I think you changed up that question. In
 13:35:57 **20** the Gareis report I specify what set of equations I
 13:36:01 **21** used in the paragraph that precedes section 3 on page
 13:36:05 **22** 3. "It was decided to use the Large-Eddy Simulation
 13:36:11 **23** (LES) method..." And then I go on to talk about
 13:36:16 **24** buoyancy and eddy formation, but that is the
 13:36:19 **25** indication of which equations were used. Later in
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13:36:21 **1** that same paragraph it's written: "The unsteady
 13:36:26 **2** Navier-Stokes equations are filtered so that eddies
 13:36:30 **3** whose scales are smaller than the mesh..." and I
 13:36:33 **4** could go on and on, but the point is the LES and the
 13:36:36 **5** Navier-Stokes equations are la -- listed here.
 13:36:40 **6** Q. Could you please write down the filtered
 13:36:44 **7** Navier-Stokes equations?
 13:36:46 **8** MR. GOSS: Oh, pop quiz time.
 13:36:50 **9** A. I think I can. This is like a --
 13:36:53 **10** Do I have a pen? Could I use a pen?
 13:36:53 **11** MR. ASSAAD: Do you have a pen?
 13:36:58 **12** [Pen provided to the witness.]
 13:36:58 **13** Q. And I'm talking about the filtered
 13:37:00 **14** Navier-Stokes equations that are utilized in ANSYS.
 13:37:04 **15** A. It's a long equation, it is written in my
 13:37:07 **16** journal paper. I'm going to try to do it from memory.
 13:37:23 **17** (Witness writing.)
 13:37:57 **18** I think that's it. Without checking a book
 13:37:59 **19** or my paper, that's what I recall.
 13:38:02 **20** MR. ASSAAD: Let's mark this as Exhibit
 13:38:05 **21** Number 11.
 13:38:16 **22** (Abraham Exhibit 11 marked for
 13:38:16 **23** identification.)
 13:38:16 **24** BY MR. ASSAAD:
 13:38:19 **25** Q. And can you please describe what each of the
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13:38:21 **1** terms are, each of the -- each of the terms.
 13:38:26 **2** A. Yes, I can.
 13:38:30 **3** The first term in this equation is what's
 13:38:33 **4** called the inertial term. Rho is the density of the
 13:38:37 **5** fluid. U -- this -- this symbol, it looks like a --
 13:38:43 **6** almost like a 2, it refers to a partial derivative,
 13:38:48 **7** and you see that same term down here [indicating].
 13:38:51 **8** Now down below there's a "T," that stands for time,
 13:38:55 **9** and up here there's a "U," and that stands for
 13:38:58 **10** velocity. There is a subscript "i" here and that
 13:39:02 **11** refers to what's called tensor notation, and it's just
 13:39:07 **12** a way of making your results more compact, so you --
 13:39:10 **13** In actuality there's equations in all three
 13:39:13 **14** directions, the X, Y, Z direction, and we just use "U"
 13:39:17 **15** to represent the fact that there's --
 13:39:19 **16** Q. So the first is the inertia term; correct?
 13:39:21 **17** A. Correct.
 13:39:21 **18** Q. What's the second one, the second section?
 13:39:24 **19** A. The second term, and there's a rho here,
 13:39:27 **20** again that's the density. There's a "U" again, and
 13:39:31 **21** that's the same as the "U" that appears here. And
 13:39:34 **22** then there's this -- again this funny 2 above and
 13:39:38 **23** below, and this is a -- it's really a derivative of
 13:39:41 **24** velocity with respect to position. So this is a --
 13:39:44 **25** what's called a velocity gradient.
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13:39:46 **1** Q. Okay.
 13:39:46 **2** A. This term is a momentum term of the flowing
 13:39:50 **3** fluid.
 13:39:50 **4** Q. So you have the inertia and the momentum;
 13:39:52 **5** correct?
 13:39:53 **6** A. Correct.
 13:39:53 **7** Q. And what's on the other side of the equal
 13:39:55 **8** sign?
 13:39:56 **9** A. On the other side of the equal sign there is
 13:39:58 **10** a derivative of pressure, so "P" stands for pressure,
 13:40:04 **11** "X" again stands for position, so this is a pressure
 13:40:08 **12** gradient term.
 13:40:10 **13** Q. Okay. And what's the next term?
 13:40:13 **14** A. The next term relates to viscosity. So mu
 13:40:16 **15** is the viscosity of the fluid, and here we have a
 13:40:20 **16** second derivative of velocity with respect to
 13:40:25 **17** position. So you can think of it as a gradient of a
 13:40:27 **18** gradient, and it really is a friction term.
 13:40:30 **19** Q. Now that's different than the Navier-Stokes
 13:40:34 **20** equations because it's filtered; correct?
 13:40:41 **21** A. Well the filtering --
 13:40:43 **22** Well no. This -- This is the Navier-Stokes
 13:40:45 **23** equation.
 13:40:45 **24** Q. What's the filtered Navier-Stokes equation?
 13:40:45 **25** A. So there's a --
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13:40:49 **1** Q. Can you write down that equation?
 13:40:51 **2** MR. GOSS: Let him answer the first
 13:40:52 **3** question.
 13:40:53 **4** MR. ASSAAD: I withdraw that question.
 13:40:54 **5** Q. Can you write down the filtered
 13:40:58 **6** Navier-Stokes equation?
 13:40:59 **7** A. Yes.
 13:41:00 **8** Q. Go ahead.
 13:41:00 **9** A. The filtering occurs right here
 13:41:04 **10** [indicating]. It occurs in this tau term. So the
 13:41:07 **11** issue of filtering is this. Some -- This is applied
 13:41:12 **12** to different size scales, and you have to remember
 13:41:16 **13** we're solving this equation at all of the elements,
 13:41:20 **14** all of the mesh elements. And there are frictional
 13:41:24 **15** terms, there's -- there's shear terms that are not
 13:41:27 **16** captured just by this, but are related to turbulence,
 13:41:33 **17** and they appear here.
 13:41:35 **18** Now some of that turbulence structure is
 13:41:39 **19** bigger than our elements, and for those turbulence
 13:41:42 **20** structures we're going to capture it directly, but
 13:41:44 **21** some of the -- some of the motion's smaller than an
 13:41:47 **22** element, and for those we have to do what's called
 13:41:50 **23** modeling, and we use what's called a sub-grid scale
 13:41:53 **24** model to account for small turbulent structures that
 13:41:56 **25** are smaller than an element, and that's the filtering

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13:42:00 **1** process.
 13:42:00 **2** Q. And in ANSYS you use WALE; correct?
 13:42:04 **3** A. I use the LES WALE method.
 13:42:07 **4** Q. Okay. Can you please write down those
 13:42:09 **5** equations?
 13:42:09 **6** A. No.
 13:42:10 **7** Q. You can't do that?
 13:42:11 **8** A. I cannot write those from memory. I
 13:42:11 **9** didn't --
 13:42:12 **10** Q. Okay.
 13:42:13 **11** A. -- realize this was a memory test. I cannot
 13:42:15 **12** write them from memory.
 13:42:16 **13** Q. Okay. So --
 13:42:17 **14** But you have worked with ANSYS on numerous
 13:42:19 **15** times; correct?
 13:42:20 **16** A. That is correct.
 13:42:20 **17** Q. And you've done --
 13:42:22 **18** And I think you mentioned before that you've
 13:42:23 **19** actually done coding for ANSYS; correct? You've
 13:42:28 **20** written some code for them?
 13:42:30 **21** A. I have modified the ANSYS code.
 13:42:32 **22** Q. Okay.
 13:42:33 **23** A. I don't know if I've written code that they
 13:42:34 **24** have imported into their software.
 13:42:38 **25** Q. And you understand that the sub-grid --

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13:42:40 **1** sub-grid scale used by ANSYS is LES WALE; correct?
 13:42:45 **2** A. That is one of the options. That's the
 13:42:46 **3** option I used.
 13:42:47 **4** Q. Okay. And that itself has equations to
 13:42:51 **5** model the sub-grid scale; correct?
 13:42:52 **6** A. That is correct.
 13:42:53 **7** Q. And sitting here today, you can't write down
 13:42:55 **8** the equations for the sub-grid scale that you used.
 13:42:57 **9** A. With --
 13:42:57 **10** MR. GOSS: Asked and answered.
 13:42:59 **11** Q. Correct?
 13:43:00 **12** A. Without a reference I cannot write them from
 13:43:02 **13** memory.
 13:43:10 **14** Q. Are you able to write down the equations for
 13:43:14 **15** the Boussinesq approximation?
 13:43:19 **16** A. I think I could write that down.
 13:43:20 **17** Q. Please do, on that same piece of paper.
 13:43:23 **18** A. (Witness complying.)
 13:44:57 **19** From memory I think it is this.
 13:44:59 **20** Q. By the way, can you label each of the
 13:45:01 **21** equations, of what they are?
 13:45:03 **22** A. Certainly. (Witness complying.)
 13:45:27 **23** Q. And the options in ANSYS, you either can use
 13:45:31 **24** Boussinesq or Ideal; correct? Ideal Gas.
 13:45:34 **25** A. Those are two options.

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13:45:36 **1** Q. Okay. I'm going to backtrack a little bit.
 13:45:42 **2** (Abraham Exhibit 12 marked for
 13:45:52 **3** identification.)
 13:45:52 **4** (Discussion off the stenographic record.)
 13:45:52 **5** BY MR. ASSAAD:
 13:45:52 **6** Q. I just have a quick question. This is an
 13:45:55 **7** email on June 1st, 2017 from Dr. Minkowycz to
 13:46:01 **8** yourself. Do you see that?
 13:46:02 **9** A. Yes.
 13:46:02 **10** Q. And you produced this in response to our
 13:46:03 **11** subpoena; correct?
 13:46:04 **12** A. Yes.
 13:46:06 **13** Q. What's the attachment?
 13:46:08 **14** A. I don't know what the attachment is. It may
 13:46:10 **15** be this letter that he sent me. I think it's that
 13:46:14 **16** letter, but I don't know.
 13:46:16 **17** MR. GOSS: I'll represent to you that it is
 13:46:19 **18** the acceptance letter.
 13:46:20 **19** MR. ASSAAD: Okay.
 13:46:21 **20** Q. So the acceptance letter was emailed to you
 13:46:23 **21** on June 1st, 2017; correct?
 13:46:26 **22** A. That's what this says.
 13:46:27 **23** Q. Okay. Now going back to the 505 model --
 13:46:43 **24** Strike that.
 13:46:44 **25** MR. ASSAAD: And you're talking about the

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13:46:45 **1** acceptance letter that was produced to us last week;
 13:46:47 **2** correct?
 13:46:49 **3** MR. GOSS: It's -- Did you already mark it
 13:46:52 **4** as an exhibit?
 13:46:53 **5** MR. ASSAAD: But it was produced last week
 13:46:55 **6** to us; correct?
 13:46:56 **7** MR. GOSS: It's Exhibit -- It's 7.
 13:46:58 **8** MR. ASSAAD: I understand, but it was
 13:46:59 **9** produced to us last week.
 13:47:03 **10** MR. GOSS: Sure. I'm not under oath, but I
 13:47:08 **11** will stand by that.
 13:47:13 **12** BY MR. ASSAAD:
 13:47:16 **13** Q. With regard to the communications you had
 13:47:17 **14** with *Numerical Heat Transfer* journal, these
 13:47:23 **15** communications were prior to your deposition in July;
 13:47:30 **16** correct?
 13:47:31 **17** A. Correct.
 13:47:31 **18** Q. And you did not produce those to us in
 13:47:34 **19** responsive to our subpoena back then; correct?
 13:47:36 **20** MR. GOSS: I'll just state an objection
 13:47:37 **21** that Dr. Elghobashi had refused to produce any
 13:47:42 **22** journal correspondence under the Ingelfinger rule, we
 13:47:45 **23** responded in kind.
 13:47:50 **24** MR. ASSAAD: Is there a legal objection?
 13:47:53 **25** MR. GOSS: It's an explanation. It's an
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13:47:55 **1** explanation.
 13:47:57 **2** BY MR. ASSAAD:
 13:47:58 **3** Q. So you did not produce --
 13:47:59 **4** When did you produce these documents, like
 13:48:02 **5** Exhibits Number 12, as well as the acceptance letter,
 13:48:04 **6** to your attorneys?
 13:48:06 **7** A. I don't recall.
 13:48:08 **8** Q. Was it in responsive to the subpoena that
 13:48:10 **9** was issued to you in January of this year, or a
 13:48:12 **10** previous subpoena?
 13:48:13 **11** A. I don't recall.
 13:48:31 **12** Q. Do you keep a correspondence file with
 13:48:33 **13** respect to what you send over to your attorneys, or
 13:48:38 **14** 3M?
 13:48:39 **15** A. I don't send anything to 3M. I don't recall
 13:48:41 **16** sending anything to 3M.
 13:48:42 **17** Q. Or their attorneys?
 13:48:45 **18** A. What is a correspondence file?
 13:48:46 **19** Q. Do you keep track of what documents you send
 13:48:50 **20** back and forth between you and counsel for 3M?
 13:48:53 **21** A. I do not.
 13:49:21 **22** Q. When you ran your CFD for the 505 were there
 13:49:32 **23** any errors that occurred with respect to the CFD?
 13:49:39 **24** A. Can you define "error"?
 13:49:41 **25** Q. Were any error --
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13:49:42 **1** Was there any error notices by ANSYS with
 13:49:45 **2** respect to how you were doing the CFD?
 13:49:47 **3** A. I don't recall.
 13:49:50 **4** Q. If there is an error -- If there is an error
 13:49:59 **5** -- Strike that.
 13:49:59 **6** When you run ANSYS and if you're doing
 13:50:02 **7** something incorrectly or against ANSYS' best
 13:50:09 **8** practices, it'll indicate it to you by an error
 13:50:11 **9** message; correct?
 13:50:13 **10** A. It may, but sometimes it'll tell you if
 13:50:17 **11** you're doing something that's advanced and they'll
 13:50:20 **12** give you a warning saying you're doing something
 13:50:22 **13** that's advanced, only people with advanced knowledge
 13:50:25 **14** should be doing this. So they give -- sometimes
 13:50:27 **15** they'll give you a warning that general practice is to
 13:50:33 **16** do it a different way. So there -- there are all
 13:50:35 **17** sorts of different warnings that you may get.
 13:50:37 **18** Q. Did you get any in this case with the 505?
 13:50:39 **19** A. I don't recall.
 13:50:40 **20** Q. Did you look?
 13:50:42 **21** A. I would have noticed them if I got one.
 13:50:55 **22** Q. For example, if you used -- ANSYS might give
 13:50:58 **23** you a warning if you used the wrong subscale --
 13:51:02 **24** sub-grid scale.
 13:51:05 **25** A. I don't think that's quite right. I mean,
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13:51:09 **1** there are choices that you make, and ANSYS may
 13:51:13 **2** recommend a different choice and it may not. But to
 13:51:17 **3** say that one is right or wrong, I -- I don't think I
 13:51:20 **4** would agree with that.
 13:51:20 **5** Q. Well does it give you a recommendation or
 13:51:22 **6** does it give an error message?
 13:51:24 **7** A. I don't know the answer to that.
 13:51:25 **8** Q. Have you ever received an error message in
 13:51:27 **9** any of the work you did on ANSYS?
 13:51:29 **10** A. I almost always receive error messages.
 13:51:32 **11** Q. And what do you do in those situations?
 13:51:34 **12** A. I evaluate the error message and decide if
 13:51:36 **13** action is needed -- needs to be taken.
 13:51:52 **14** Q. Now in your 505 you looked at the 505
 13:51:59 **15** Service Manual to determine the volumetric flow rate
 13:52:04 **16** for the Bair Hugger unit; correct?
 13:52:29 **17** A. That is incorrect.
 13:52:46 **18** Q. Did you look at the Operator's Manual?
 13:52:47 **19** A. That is correct.
 13:52:48 **20** Q. So you looked at the Operators Manual to
 13:52:49 **21** determine the flow rate; correct? Or the volumetric
 13:52:52 **22** flow rate.
 13:52:53 **23** A. Yes.
 13:52:54 **24** Q. And you obtained -- you used the number 28
 13:52:58 **25** cubic feet per minute; correct?
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13:53:00 **1** A. That is correct.

13:53:01 **2** Q. Okay. And according to the Operator's

13:53:03 **3** Manual, it actually gives 28 to 30 cubic feet per

13:53:06 **4** minute; correct?

13:53:07 **5** A. That is correct.

13:53:12 **6** Q. And you yourself relied on the 505

13:53:14 **7** Operator's Manual to obtain the volumetric flow rate.

13:53:20 **8** A. I actually don't recall if I relied on it,

13:53:25 **9** or if I had an idea of the flow rate and I just

13:53:28 **10** checked it to see if it was consistent with the

13:53:30 **11** Operator's Manual. I don't recall. But in the end,

13:53:35 **12** the 28 is consistent with the Operator's Manual.

13:53:38 **13** Q. Okay.

13:53:40 **14** A. But I don't recall which -- whether I relied

13:53:42 **15** on -- primarily on my memory or the Operator's Manual.

13:53:50 **16** Q. What's the volumetric flow rate of --

13:53:52 **17** I mean, you've done work for Smiths Medical,

13:53:58 **18** correct, on their forced-air warming machines;

13:54:00 **19** correct?

13:54:00 **20** A. That is correct.

13:54:01 **21** Q. What's the volumetric flow rate for the

13:54:03 **22** Smiths Medical device?

13:54:04 **23** A. They have many devices.

13:54:06 **24** Q. Well what's the device you worked on?

13:54:07 **25** A. I worked on multiple devices.

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13:55:20 **1** designate it as Confidential under the Protective

13:55:22 **2** Order. If you're relying on something, you can

13:55:24 **3** answer his question.

13:55:27 **4** A. I ran a --

13:55:28 **5** I was hired by Smiths to evaluate their

13:55:31 **6** blankets and blowers and their competitor's, and in

13:55:35 **7** that evaluation we tested multiple Smiths Medical

13:55:41 **8** blankets and blowers and multiple 3M blankets and

13:55:44 **9** blowers, and I think other manufacturers as well. So

13:55:47 **10** I have a whole set of data from those experiments, and

13:55:54 **11** what I recall was flow rates in the range of 28.

13:55:59 **12** Q. Okay. For the Smiths Medical or for the

13:56:03 **13** 505?

13:56:04 **14** A. For upper body blankets with lower blowers,

13:56:09 **15** lower blowers. So both -- all companies had a high

13:56:14 **16** blow -- high blower case and they've got different

13:56:16 **17** blower settings, and a lower blower case.

13:56:20 **18** And just to put on the record, the reason

13:56:22 **19** why I struggled with the proprietary nature is Smiths

13:56:25 **20** does not want oth -- their competitors to know I

13:56:28 **21** tested their blankets.

13:56:38 **22** Q. There's no indication in your report which

13:56:41 **23** has been marked as Exhibit Number 1, that you -- when

13:56:52 **24** you tested the -- when you did the 505 CFD that you

13:56:57 **25** had the Bair Hugger -- you ran it with the Bair Hugger

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13:54:09 **1** Q. Can you give me one?

13:54:10 **2** A. I can give you the --

13:54:11 **3** They were named with letters and numbers,

13:54:16 **4** they were EQ something, I don't remember the number.

13:54:22 **5** The devices that I worked on formed the basis of the

13:54:26 **6** journal publication that I did in I think 2016 on

13:54:31 **7** patient-warming devices, but I don't remember the

13:54:32 **8** model numbers of the blankets. I remember there being

13:54:35 **9** multiple blankets.

13:54:36 **10** Q. What about the blower; do you remember the

13:54:39 **11** volumetric flow rate of the blower?

13:54:41 **12** A. I worked on multiple blowers.

13:54:43 **13** Q. Any one of them.

13:54:45 **14** A. I would have to refer to my records for that

13:54:49 **15** study.

13:54:51 **16** Q. How --

13:54:51 **17** I mean, if you did not use the Operator's

13:54:53 **18** Manual to determine the flow rate being 28 with the

13:54:57 **19** 505, what are you relying upon?

13:55:05 **20** A. And I'm going to ask a question.

13:55:08 **21** THE WITNESS: This is a proprietary --

13:55:13 **22** MR. ASSAAD: If he's relying on something,

13:55:14 **23** it's -- we have a confiden --

13:55:16 **24** A. I'll tell you -- I'll tell you -- I --

13:55:18 **25** MR. GOSS: If it's proprietary we would

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13:57:00 **1** off; correct?

13:57:01 **2** A. That is correct.

13:57:02 **3** Q. Going back to Smiths Medical, you understand

13:57:04 **4** that Smiths Medical and 3M are competitors.

13:57:06 **5** A. I understand that.

13:57:09 **6** Q. In the field of patient warming.

13:57:11 **7** A. That's what I understand.

13:57:16 **8** Q. When you were retained by 3M to do research,

13:57:20 **9** did you inform Smiths Medical that you were -- been

13:57:25 **10** asked by 3M to do research on their blowers?

13:57:27 **11** A. Yes.

13:57:29 **12** Q. Who'd you speak with at Smiths Medical?

13:57:32 **13** A. I don't recall.

13:57:36 **14** Q. Was there a conflict of interest for you

13:57:38 **15** doing work with Smiths Medical and 3M?

13:57:41 **16** A. Not --

13:57:41 **17** I do not believe there is.

13:57:43 **18** Q. Did you ask for any sort of waiver regarding

13:57:46 **19** any conflict?

13:57:47 **20** A. I don't --

13:57:48 **21** MR. GOSS: Object to form.

13:57:49 **22** A. I don't recall asking for a waiver.

13:58:04 **23** Q. Now I'm going to get into your report real

13:58:07 **24** quick, but just -- I know I've asked you this before.

13:58:09 **25** I just want to be sure we're on the same page.

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13:58:11 **1** The only thing that changes between the 750
 13:58:16 **2** and the 505 CFD analysis is the volumetric flow out of
 13:58:22 **3** the Bair Hugger.
 13:58:23 **4** **A.** That is all that I recall changing.
 13:58:25 **5** **Q.** You used the same equations; correct?
 13:58:27 **6** **A.** Correct.
 13:58:44 **7** **Q.** You used 41 degrees Celsius; correct?
 13:58:46 **8** **A.** Correct.
 13:58:47 **9** **Q.** And that was higher than what Dr. Elghobashi
 13:58:49 **10** used in his 505 analysis; correct?
 13:58:54 **11** **A.** I don't recall what he used.
 13:58:56 **12** **Q.** If he used 40.5 degrees, you would agree
 13:58:58 **13** with me that 41 degrees is higher than 40.5.
 13:59:01 **14** **A.** I agree.
 13:59:02 **15** **Q.** Okay. Your air inlet temperature was 15
 13:59:05 **16** degrees Celsius; correct? From the ceiling.
 13:59:11 **17** **A.** Correct.
 13:59:12 **18** **Q.** And do you agree with me that that's the
 13:59:15 **19** same temperature that Dr. Elghobashi used in his CFD
 13:59:17 **20** analysis?
 13:59:18 **21** **A.** I -- I agree.
 13:59:21 **22** **Q.** You had four exhaust vents in your CFD
 13:59:24 **23** analysis; correct?
 13:59:25 **24** **A.** Correct.
 13:59:25 **25** **Q.** That's the same as Dr. Elghobashi used in
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13:59:27 **1** his CFD analysis; correct?
 13:59:29 **2** **A.** Correct.
 13:59:35 **3** **Q.** Your room sizes were very similar, but not
 13:59:38 **4** exact between you and Dr. Elghobashi; correct?
 13:59:40 **5** **A.** Correct.
 13:59:41 **6** **Q.** You used an exchange -- air -- air changes
 13:59:46 **7** per hour of 27.69 in your CFD analysis; correct?
 13:59:53 **8** **A.** Well it states here an air change every 130
 13:59:56 **9** seconds. I could convert that to hours. But my
 13:59:59 **10** report says one air change every 130 seconds.
 14:00:08 **11** **Q.** And to calculate the air-exchange rate you
 14:00:11 **12** would divide -- you'd take 3600 and divide it by 130;
 14:00:15 **13** correct?
 14:00:15 **14** **A.** Yes.
 14:00:19 **15** **Q.** I represent to you that that number is
 14:00:22 **16** 27.692. So would you agree with me that the air
 14:00:25 **17** change rate per hour is 27.69 in your CFD analysis?
 14:00:29 **18** **A.** Yes, I would.
 14:00:30 **19** **Q.** Now you say, approximately every 130
 14:00:33 **20** seconds; correct?
 14:00:36 **21** Do you know what the --
 14:00:37 **22** **A.** Incorrect.
 14:00:42 **23** **Q.** So you had an air exchange every 130
 14:00:44 **24** seconds?
 14:00:46 **25** **A.** That's what this statement says. It says,
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14:00:48 **1** "The volume of the room is 5190 cubic feet...so that
 14:00:54 **2** the ventilation flow resulted in one air change every
 14:00:57 **3** 130 seconds."
 14:00:58 **4** **Q.** So that's an exact number; correct?
 14:01:02 **5** **A.** Well it's exact to the two significant
 14:01:05 **6** figures. It may be 130.2, it might be 129.8, but I'm
 14:01:11 **7** not claiming that level of accuracy.
 14:01:13 **8** **Q.** And you would agree with me that with
 14:01:15 **9** respect to the operating -- or the surgical table, you
 14:01:20 **10** used the same height as Dr. Elghobashi.
 14:01:23 **11** **A.** I don't know that.
 14:01:25 **12** **Q.** But it was very similar to height and shape;
 14:01:27 **13** correct?
 14:01:28 **14** **A.** I don't know...
 14:01:29 **15** I don't recall what his height was.
 14:01:31 **16** **Q.** Okay. Now you agree with me -- Strike that.
 14:01:49 **17** On page 1 in your report of Exhibit 1,
 14:01:56 **18** second paragraph, you state: "Note that the assumed
 14:02:01 **19** temperature of 41 degrees Celsius at the blanket
 14:02:04 **20** outlet is significantly higher than temperatures
 14:02:07 **21** measured in experimental settings...for example, T.
 14:02:12 **22** Kuehn General Causation report Exhibit C."
 14:02:15 **23** Did I read that correctly?
 14:02:16 **24** **A.** Yes.
 14:02:16 **25** **Q.** Are you referring to any other experimental
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14:02:18 **1** settings besides Dr. Kuehn's general causation report?
 14:02:25 **2** **A.** No.
 14:02:28 **3** **Q.** Are you relying in any way with re -- to Dr.
 14:02:31 **4** Kuehn's general causation report to offer any opinions
 14:02:35 **5** with respect to the exit temperature of the Bair
 14:02:39 **6** Hugger as the air -- as the Bair Hugger -- of the Bair
 14:02:41 **7** Hugger air as it leaves the perforations from the
 14:02:44 **8** blanket?
 14:02:44 **9** MR. GOSS: In his model, or otherwise?
 14:02:47 **10** MR. ASSAAD: Otherwise.
 14:02:49 **11** **A.** Could you read back that?
 14:02:50 **12** **Q.** I'll rephrase it.
 14:02:52 **13** **A.** Yeah.
 14:02:53 **14** **Q.** You're saying that 41 degrees Celsius is
 14:02:55 **15** significantly higher than the temperatures measured in
 14:02:58 **16** experimental settings, and you rely on Dr. Kuehn's
 14:03:02 **17** report; correct?
 14:03:04 **18** **A.** No. I think you've misinterpreted that.
 14:03:07 **19** The key sentence is the next sentence. "Again, my
 14:03:11 **20** intent was to model a worst-case scenario to
 14:03:14 **21** exaggerate the effect" of Bair Hugger -- "of the Bair
 14:03:16 **22** Hugger on the operating room airflow."
 14:03:18 **23** So what I'm saying here is I'm acknowledging
 14:03:21 **24** that 41 Celsius is artificially high. I'm choosing it
 14:03:26 **25** because it's a worst-case scenario.
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14:03:28 **1** Q. Okay. My question is: Are you saying it's
 14:03:30 **2** artificially high because of the experimental data
 14:03:33 **3** from Dr. Kuehn?
 14:03:34 **4** A. No.
 14:03:35 **5** Q. Okay. So why are you putting in here Dr.
 14:03:38 **6** Kuehn's general report, Exhibit C?
 14:03:41 **7** A. Because that's an example of someone who has
 14:03:43 **8** made measurements that are lower.
 14:03:46 **9** Q. Have you read his deposition, Dr. Kuehn's
 14:03:49 **10** deposition?
 14:03:49 **11** A. I have read his deposition.
 14:03:54 **12** Q. What other data are you relying upon with
 14:03:58 **13** respect to the actual temperature of the exit air
 14:04:00 **14** coming from the Bair Hugger?
 14:04:02 **15** A. My own experimental data.
 14:04:04 **16** Q. Where is that?
 14:04:05 **17** A. I ran experiments in per --
 14:04:08 **18** Q. I didn't say what. I said where?
 14:04:10 **19** A. Oh, I don't have that data.
 14:04:11 **20** Q. Okay. And since you don't have that data,
 14:04:26 **21** that data was never produced to us; correct? In this
 14:04:29 **22** case.
 14:04:29 **23** A. That is correct.
 14:05:06 **24** Q. What is the difference between using the
 14:05:09 **25** Boussinesq approximation and Ideal Gas law in ANSYS?
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14:05:16 **1** A. The difference is how the density is
 14:05:20 **2** calculated, and in particular how changes in density
 14:05:23 **3** are calculated. The Boussinesq relates density
 14:05:26 **4** changes to temperature differences, and the Ideal Gas
 14:05:30 **5** law calculates density changes using the Ideal Gas
 14:05:35 **6** law.
 14:05:35 **7** Q. Which one's more accurate?
 14:05:39 **8** A. It --
 14:05:40 **9** MR. GOSS: I feel like we went over this in
 14:05:42 **10** the last deposition, but you can answer the question.
 14:05:44 **11** A. I did answer this in the last deposition,
 14:05:47 **12** and my answer is the same, and that is this: The
 14:05:50 **13** Boussinesq model is going to overestimate any effect
 14:05:55 **14** that the Bair Hugger might have. So again I'm
 14:05:58 **15** choosing a worst-case scenario to stack the cards
 14:06:03 **16** against the Bair Hugger to see if I can get intrusion
 14:06:06 **17** of air to the surgical site.
 14:06:08 **18** Q. Okay. With respect to the images that were
 14:06:42 **19** -- Withdraw.
 14:06:42 **20** The mesh that you used in the 505 results in
 14:06:46 **21** your report of Exhibit 1, is that the
 14:06:50 **22** nine-million-cell mesh that was used in the 750?
 14:06:53 **23** A. That is my recollection.
 14:07:18 **24** Q. Why did you run the 505 model longer than
 14:07:24 **25** the 750 model and simulation time?
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14:07:32 **1** A. I don't know the answer to that. It may be
 14:07:34 **2** that I used --
 14:07:35 **3** Q. If you don't -- If you don't know the
 14:07:36 **4** answer, I don't want any guessing, so that's fine.
 14:07:39 **5** Did you use the same computer for both the
 14:07:43 **6** 505 and the 750?
 14:07:44 **7** A. Yes.
 14:07:45 **8** Q. Is that the computer that was given to you
 14:07:46 **9** by a grant back about five or six years ago?
 14:07:50 **10** A. I don't know if that computer was given by a
 14:07:53 **11** grant. I don't recall.
 14:07:56 **12** Q. In 2009 you were given 4,200 for the
 14:07:59 **13** purchase of a high-performance computer for numerical
 14:08:03 **14** simulations. University of St. Thomas Faculty
 14:08:06 **15** Development Grant.
 14:08:08 **16** A. Are you on Exhibit 6?
 14:08:10 **17** Q. Your CV.
 14:08:11 **18** A. Okay.
 14:08:12 **19** Q. Page 5.
 14:08:21 **20** A. (Witness reviewing exhibit.) I -- No, I
 14:08:23 **21** don't -- this computer was not the computer associated
 14:08:26 **22** with that grant.
 14:08:27 **23** Q. Okay. And similar to the 750, you did not
 14:08:53 **24** use any type of -- or place any people in your CFD
 14:08:58 **25** analysis; correct?
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14:09:00 **1** A. That is incorrect.
 14:09:01 **2** Q. You have people in your CFD analysis?
 14:09:03 **3** A. The patient's there.
 14:09:05 **4** Q. Oh, okay. Besides the patient there's no
 14:09:08 **5** surgical staff or anesthesiology -- anesthesiologist
 14:09:10 **6** in your CFD analysis; correct?
 14:09:12 **7** A. That is correct.
 14:09:15 **8** Q. And you did not use any size particles in
 14:09:17 **9** your CFD analysis; correct?
 14:09:20 **10** A. That is correct.
 14:09:21 **11** Q. Okay. Did you alter the mesh in any way
 14:09:42 **12** between the 505 and the 750?
 14:09:44 **13** A. I cannot recall altering the mesh in any
 14:09:47 **14** way.
 14:09:48 **15** Q. So the an --
 14:09:49 **16** A. I don't believe I did.
 14:09:53 **17** Q. With respect to the Boussinesq approximation
 14:09:57 **18** that was used in the 505, when you use Boussinesq,
 14:10:03 **19** what terms does the model change in the Navier-Stokes
 14:10:07 **20** equations?
 14:10:07 **21** A. It changes the buoyancy term.
 14:10:09 **22** Q. And which one's that in the equation that's
 14:10:11 **23** been marked as an exhibit?
 14:10:21 **24** A. In this exhibit there is a term here which
 14:10:25 **25** is the pressure gradient, and inside there is a
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14:10:28 **1** buoyancy term. [Exhibit 11.]

14:10:30 **2** **Q.** So it's the pressure gradient that the

14:10:32 **3** Boussinesq is used -- alters in the Navier-Stokes

14:10:40 **4** equation.

14:10:40 **5** **A.** It's the buoyancy term which is contained

14:10:43 **6** within the pressure gradient.

14:10:44 **7** **Q.** Okay. Now you mentioned that you have

14:11:08 **8** validated the 750 results; correct?

14:11:12 **9** **A.** Yes.

14:11:13 **10** **Q.** By experimentation; correct?

14:11:15 **11** **A.** Yes.

14:11:15 **12** **Q.** Did you do the same validation for the 505

14:11:17 **13** results?

14:11:18 **14** **A.** No.

14:11:21 **15** **Q.** And your validation in the 750 was two

14:11:26 **16** temperature -- temperature taken and smoke tests;

14:11:34 **17** correct?

14:11:34 **18** **MR. GOSS:** Object to form.

14:11:36 **19** **A.** It was visible water vapor. The primary

14:11:40 **20** validation was comparing the flow patterns via visible

14:11:44 **21** water vapor in my simulations, and I also compared

14:11:47 **22** temperatures.

14:11:48 **23** **Q.** And actually in your report, your -- in

14:11:55 **24** *Numerical Heat Transfer*, Exhibit 3, you actually

14:11:58 **25** indicate -- or you superimpose your streamlines and

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14:12:01 **1** your water vapor tests; correct?

14:12:04 **2** **A.** That is correct.

14:12:09 **3** **Q.** You did not create a graph or a table

14:12:12 **4** showing different data with respect to the

14:12:20 **5** experimental data compared to the CFD analysis data.

14:12:26 **6** **A.** You asked about a graph and something else?

14:12:28 **7** **Q.** Okay. You've done validation before with

14:12:31 **8** respect to CFD analysis and experiments; correct?

14:12:34 **9** **A.** Yes.

14:12:34 **10** **Q.** And if you look at the validation even that

14:12:37 **11** you -- that you reviewed with respect to what Apte and

14:12:43 **12** Mahesh have done with respect to the Stanford code,

14:12:45 **13** you see a lot of models showing a line graph depicting

14:12:50 **14** the experimental data and what the CFD data has

14:12:53 **15** obtained.

14:12:54 **16** **A.** Yes.

14:12:55 **17** **Q.** And that's commonly done when you're trying

14:12:57 **18** to validate a code or -- with respect to experiments;

14:13:03 **19** correct?

14:13:04 **20** **A.** It is sometimes done.

14:13:05 **21** **Q.** Well you've done that before in the past;

14:13:10 **22** correct?

14:13:10 **23** **A.** Yes, I have.

14:13:11 **24** **Q.** You've actually done that with Dr. Sparrow

14:13:13 **25** on multiple occasions; correct?

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14:13:15 **1** **A.** Yes.

14:13:16 **2** **Q.** Okay. You did not do that type of analysis

14:13:18 **3** with respect to your validation in -- with re -- in

14:13:22 **4** your report; correct?

14:13:24 **5** **A.** Just so I understand the question you're

14:13:25 **6** asking. Did I do a validation involv -- or showing a

14:13:28 **7** line graph -- or data on a line graph to compare the

14:13:32 **8** experiments with the simulation. That's your

14:13:34 **9** question?

14:13:34 **10** **Q.** Yes.

14:13:35 **11** **A.** The answer is no, I did not.

14:13:54 **12** (Abraham Exhibit 13 marked for

14:14:04 **13** identification.)

14:14:04 **14** (Discussion off the stenographic record.)

14:14:05 **15** BY MR. ASSAAD:

14:14:07 **16** **Q.** What's been marked as Exhibit 13 is an

14:14:09 **17** article -- from a chapter from *Numerical Heat Transfer*

14:14:14 **18** that you are an author with with Dr. Sparrow and Dr.

14:14:19 **19** Minkowycz; correct?

14:14:20 **20** **A.** That is correct.

14:14:22 **21** **Q.** And --

14:14:23 **22** **A.** Oh wait. Hold on. I think that's not

14:14:26 **23** correct. That is incorrect.

14:14:29 **24** **Q.** You did not co-author this with Dr. Sparrow

14:14:31 **25** and Dr. Minkowycz?

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14:14:32 **1** **A.** I did.

14:14:35 **2** **Q.** Oh, *Advances in Heat Transfer*; correct?

14:14:37 **3** **A.** Correct.

14:14:41 **4** **Q.** And you do validation to determine the

14:14:43 **5** different type of models between K-epsilon, RNG

14:14:47 **6** K-epsilon, LES with respect to experimental results;

14:14:51 **7** correct?

14:14:52 **8** **A.** Correct.

14:14:53 **9** **Q.** And you show validation curves with respect

14:14:56 **10** to the -- what the model shows and what the

14:15:00 **11** experimental data shows.

14:15:02 **12** **A.** We show comparisons between the model and

14:15:04 **13** the experiment. I don't know if I'd call that a

14:15:07 **14** validation curve, but we do show comparisons.

14:15:10 **15** **Q.** And with the comparisons you have more than

14:15:11 **16** two data points; correct?

14:15:13 **17** **A.** Yes.

14:15:14 **18** **Q.** And in fact you have between 15 to 20 data

14:15:17 **19** points for each comparison; correct?

14:15:19 **20** **A.** Could you tell me where you're looking?

14:15:20 **21** **Q.** I'm looking on pages 12, 13, 14, 15.

14:15:34 **22** **A.** It looks like approximately 20 data points.

14:15:39 **23** **Q.** And this is com --

14:15:40 **24** This type of depiction of data from the

14:15:47 **25** numerical methods of CFD and experimental is commonly

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14:15:50 **1** used among people in your field.
 14:15:54 **2** **A.** I would agree.
 14:18:06 **3** **Q.** Going to your article in *Numerical Heat*
 14:18:11 **4** *Transfer*, Exhibit 3, you testified earlier that you
 14:18:26 **5** ran at least 2,500 time steps with respect to the 750;
 14:18:31 **6** correct?
 14:18:32 **7** **A.** Yes.
 14:18:34 **8** **Q.** And the time step, I think you recall, was
 14:18:37 **9** about .01.
 14:18:40 **10** **A.** Well that's -- would -- that, as I recall,
 14:18:43 **11** was the time step associated with the 264 TRN.
 14:18:46 **12** **Q.** Did you change the time step between 264 and
 14:18:49 **13** 2500?
 14:18:50 **14** **A.** I may have.
 14:18:52 **15** **Q.** But sitting here today, you don't recall.
 14:18:54 **16** **A.** Well I know I changed the time step, but I
 14:18:59 **17** don't recall at what point that was done. The key is
 14:19:02 **18** you have to make sure your results are independent of
 14:19:04 **19** time step. So whether you change them early or later
 14:19:10 **20** isn't that important.
 14:19:12 **21** What I say here in the paper is that
 14:19:16 **22** multiple values of time steps were selected as low as
 14:19:20 **23** .0001 seconds.
 14:19:23 **24** **Q.** Well my question is: When you ran it
 14:19:25 **25** forward from 264 to 2500, you don't know one way or
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14:19:29 **1** the other whether or not you changed the time step.
 14:19:30 **2** **A.** I don't recall the time steps between 264
 14:19:33 **3** and 2500.
 14:19:35 **4** **Q.** And you may not have changed it at all;
 14:19:37 **5** correct?
 14:19:38 **6** **A.** That's possible.
 14:19:51 **7** **Q.** Do you remember, when you ran it, what the
 14:19:53 **8** simulation time was at 2500?
 14:19:55 **9** **A.** I do not.
 14:19:56 **10** **Q.** Was it more than two seconds?
 14:19:59 **11** **A.** I don't recall what it was.
 14:20:11 **12** **Q.** So sitting --
 14:20:13 **13** And I take it you don't have those files any
 14:20:15 **14** more; correct?
 14:20:16 **15** **A.** Which files?
 14:20:16 **16** **Q.** The time step of 2500 for the 750 model.
 14:20:20 **17** **A.** I do not have that file for the 750 model.
 14:20:24 **18** **Q.** Okay.
 14:21:07 **19** (Abraham Exhibit 14 marked for
 14:21:07 **20** identification.)
 14:21:07 **21** BY MR. ASSAAD:
 14:21:19 **22** **Q.** What's been marked as Exhibit 14 is your
 14:21:21 **23** Model 750 run at different time steps in which we ran
 14:21:31 **24** it forward according to what you testified was
 14:21:33 **25** possible in your general causation report -- or at the
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14:21:35 **1** deposition.
 14:21:42 **2** Do you recognize this format?
 14:21:45 **3** **A.** Yes.
 14:21:48 **4** **Q.** Do you agree with me that this looks like a
 14:21:49 **5** format that would be produced by ANSYS?
 14:21:51 **6** **A.** Yes.
 14:21:52 **7** **Q.** And it talks about time step simulation
 14:21:55 **8** time, CPU seconds, et cetera; correct?
 14:21:58 **9** **A.** Yes.
 14:22:01 **10** **Q.** And as you see, the first one had a time
 14:22:04 **11** step of 951. Do you see that?
 14:22:07 **12** **A.** Yes.
 14:22:08 **13** **Q.** Okay. And it talks about the equations and
 14:22:11 **14** the -- and the rate, the RMS res, the max res and
 14:22:17 **15** linear solution; correct?
 14:22:18 **16** **A.** Correct.
 14:22:19 **17** **Q.** And it also talks about the Courant number;
 14:22:23 **18** correct?
 14:22:24 **19** **A.** Correct.
 14:22:25 **20** **Q.** Point 36 is very high. You agree?
 14:22:28 **21** **A.** I don't know if I would agree with that.
 14:22:31 **22** **Q.** Is it an acceptable number for you?
 14:22:33 **23** **A.** I would have to check numerical instability.
 14:22:37 **24** The numerical instability guide -- It might have been
 14:22:41 **25** in my report. It's either 1 or .1 is the target, I
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14:22:46 **1** just don't recall.
 14:22:51 **2** So I -- Sitting here right now I cannot say
 14:22:55 **3** whether .36 is high or not high.
 14:23:02 **4** MR. GOSS: I'm just going to interpose the
 14:23:04 **5** objection that he obviously didn't prepare this
 14:23:06 **6** document, but he can answer questions about it if he
 14:23:08 **7** understands it.
 14:23:17 **8** **Q.** And you see at the top it says a time step
 14:23:19 **9** of 1.000E-02; correct?
 14:23:26 **10** **A.** Yes.
 14:23:27 **11** **Q.** And that's a time step of .01 seconds;
 14:23:29 **12** correct?
 14:23:29 **13** **A.** Correct.
 14:23:30 **14** **Q.** And that's a similar time step that was used
 14:23:31 **15** in the 264 TRN file.
 14:23:35 **16** **A.** Incorrect. So the -- the --
 14:23:39 **17** Remember there's multiple time steps. And
 14:23:41 **18** as I said earlier, multiple time steps were used.
 14:23:45 **19** That is the time step associated with that TRN file.
 14:23:49 **20** **Q.** Yes.
 14:23:49 **21** And that's what I asked.
 14:23:53 **22** **A.** Okay.
 14:23:54 **23** **Q.** The time step that was used in the 264 TRN
 14:23:57 **24** file was .01 seconds.
 14:23:59 **25** **A.** I agree.
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14:24:00 **1** Q. And this .01 seconds is what was used in the
 14:24:08 **2** 264.TRN file.
 14:24:09 **3** A. It is the time step associated with that 264
 14:24:12 **4** TRN file.
 14:24:13 **5** Q. Now when you go to "Linear Solution" there
 14:24:16 **6** is these letter -- it says "OK, OK, OK, OK." Do you
 14:24:19 **7** see that?
 14:24:20 **8** A. Yes.
 14:24:20 **9** Q. What does that mean?
 14:24:22 **10** A. That means the computer algorithm is making
 14:24:26 **11** satisfactory process on solving the equations, and the
 14:24:30 **12** equations are listed on the left, U momentum, V
 14:24:34 **13** momentum, W momentum and P mass. So it's giving you
 14:24:38 **14** the okay that it's proceeding well on the solution
 14:24:42 **15** path.
 14:24:46 **16** Q. Now if we go to page 4 -- 5, I mean, at the
 14:24:57 **17** bottom of the page you see the same type of graph
 14:25:02 **18** where it has "Equation," "Rate," "RMS Res," "Max Res"
 14:25:06 **19** and "Linear Solution." Do you see that?
 14:25:09 **20** A. There is no graph.
 14:25:11 **21** Q. Table.
 14:25:12 **22** A. Yes, I see a table.
 14:25:14 **23** MR. GOSS: So I understand if you're going
 14:25:16 **24** to ask him questions comparing this to a similar
 14:25:20 **25** document for the 505 model, I understand you may want
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14:25:23 **1** to make some comparisons. But obviously to the
 14:25:26 **2** extent that this is about the 264 file, that was
 14:25:29 **3** general causation.
 14:25:30 **4** So I'll give you some latitude here, but I
 14:25:33 **5** want to just keep it brief.
 14:25:35 **6** MR. ASSAAD: I understand it, but I'll let
 14:25:37 **7** you ask questions regarding any changes or additions
 14:25:39 **8** in -- in the paper that we didn't have available to
 14:25:43 **9** us. We're talking about he says 2500 iterations, so
 14:25:47 **10** I think it's a new area.
 14:25:49 **11** MR. GOSS: If it's a new area within the
 14:25:51 **12** changes described in the paper, then I'll allow it.
 14:25:54 **13** BY MR. ASSAAD:
 14:25:55 **14** Q. What do the "F's" mean?
 14:25:57 **15** A. It means that it's not making satisfactory
 14:26:00 **16** process, so that's a failed linear solution.
 14:26:03 **17** Q. So you agree with me that the number 951 is
 14:26:06 **18** less than 2500.
 14:26:09 **19** A. I agree 951 is less than 2500.
 14:26:12 **20** Q. So at time step 951 when you run your model
 14:26:18 **21** forward with a .01 second time step, your model begins
 14:26:25 **22** to fail, according to this document.
 14:26:28 **23** A. That's not necessarily true. It depends on
 14:26:31 **24** what you mean by "failure."
 14:26:34 **25** Q. I'm talking about failure as getting Fs on
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14:26:38 **1** the table because it cannot solve the pro -- not come
 14:26:42 **2** up with a solution.
 14:26:43 **3** A. No, that's not true.
 14:26:46 **4** Failure in CFD means a diverge solution.
 14:26:49 **5** This may or may not be a diverge solution or a
 14:26:52 **6** converge solution, I don't know without looking at the
 14:26:54 **7** results.
 14:26:59 **8** Q. Well you agree with me that you have
 14:27:02 **9** divergence because you're getting an "F."
 14:27:05 **10** A. No.
 14:27:05 **11** Q. Okay.
 14:27:09 **12** (Interruption by the reporter.)
 14:27:28 **13** Q. According to you, "F" means that it's not
 14:27:31 **14** making satisfactory process, that's -- so that's a
 14:27:35 **15** failed linear solution; correct?
 14:27:37 **16** A. Yes.
 14:27:38 **17** Q. So "F" means a failed linear solution.
 14:27:41 **18** A. What "F" means --
 14:27:43 **19** Q. "Yes" or "no," sir?
 14:27:45 **20** A. Yes.
 14:27:46 **21** Q. Okay.
 14:27:48 **22** MR. GOSS: Can you tell me where you get
 14:27:50 **23** the 951 time step?
 14:27:54 **24** MR. ASSAAD: The first page, Peter.
 14:27:56 **25** MR. GOSS: Oh, on the first page.
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14:27:57 **1** MR. ASSAAD: Four li -- Like, it says "TIME
 14:28:01 **2** STEP 951."
 14:28:02 **3** MR. GOSS: I see. Thank you.
 14:28:25 **4** BY MR. ASSAAD:
 14:28:25 **5** Q. I represent to you that we've run your code
 14:28:28 **6** forward with a .01 time step and your code has crashed
 14:28:32 **7** at time step 951 and it could not run forward any
 14:28:38 **8** more.
 14:28:40 **9** If that is to be true, how is it that you
 14:28:43 **10** ran to 2500 time steps, according to your published
 14:28:49 **11** paper?
 14:28:51 **12** A. If that is to be true, then we just have to
 14:28:56 **13** go right to the paper where I say, right above
 14:29:05 **14** equation 5, "Multiple values of time steps were
 14:29:09 **15** selected as low as .0001 seconds (resulting in an RMS
 14:29:15 **16** Courant" number "of approximately .001. The Courant
 14:29:19 **17** number is defined as," and then I give the definition.
 14:29:23 **18** So nowhere here does it say that I ran out
 14:29:29 **19** the 264 2500 iterations using the exact same time
 14:29:35 **20** step.
 14:29:35 **21** Q. So the only explanation, sitting here today,
 14:29:37 **22** is that you changed the time step to some smaller
 14:29:39 **23** number.
 14:29:40 **24** A. That is an explanation.
 14:29:41 **25** Q. What other explanations do you have?
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14:29:44 **1** **A.** That's the only explanation I can think of
 14:29:46 **2** now.
 14:29:47 **3** **Q.** And you're looking at Exhibit 3; correct?
 14:29:50 **4** **A.** Correct.
 14:29:56 **5** **Q.** It took you 40 days to run the 750 264 time
 14:30:07 **6** steps. How long did it take you to run 2500 time
 14:30:09 **7** steps?
 14:30:09 **8** MR. GOSS: Object to form.
 14:30:13 **9** **A.** Did I say that it took 40 days to get to
 14:30:16 **10** 264?
 14:30:16 **11** **Q.** Yes.
 14:30:17 **12** **A.** When --
 14:30:18 **13** I don't recall saying that.
 14:30:42 **14** **Q.** Let's go to your deposition, page 184.
 14:31:02 **15** Does that refresh your recollection of
 14:31:04 **16** testifying around 40 days to either get 264 or 300
 14:31:08 **17** time steps?
 14:31:10 **18** **A.** No. I think you're misreading it, actually,
 14:31:14 **19** because, as I said in my deposition, and as I pointed
 14:31:18 **20** out here in this paper, multiple results were
 14:31:21 **21** calculated and extracted, and in fact I said in my
 14:31:25 **22** deposition that I had results after 264.
 14:31:30 **23** So what I'm saying is the total run took 40
 14:31:33 **24** days. I don't recall ever saying that it took 40 days
 14:31:42 **25** to get to 264.

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14:31:45 **1** **Q.** Well you said it took -- line 20: I said
 14:31:50 **2** we're talking about the 40 days. You say: "It could
 14:31:52 **3** be 300, it could be 264, you don't know." "Correct."
 14:31:56 **4** MR. GOSS: Let's look at lines 18 and 19.
 14:32:01 **5** MS. ZIMMERMAN: Look at pages 87 and 88 as
 14:32:04 **6** well.
 14:32:05 **7** **Q.** My question is: Whether it's 264 or 300,
 14:32:08 **8** you ran 300 time steps -- up to 300 time steps in 40
 14:32:14 **9** days; correct?
 14:32:15 **10** **A.** That is incorrect.
 14:32:16 **11** MR. GOSS: Object to form.
 14:32:17 **12** **Q.** Okay. Where does it say here that you ran
 14:32:19 **13** more than 300 time steps in your -- in this section?
 14:32:22 **14** **A.** Well I say I went beyond 264. I don't
 14:32:26 **15** recall how far I went. But it took 40 days to do the
 14:32:29 **16** calculation. I'm reading from page 184, lines 18 and
 14:32:33 **17** 19. So I'm saying I don't remember how long I did the
 14:32:36 **18** run, but it took 40 days.
 14:33:17 **19** MR. GOSS: Let us know when you reach a
 14:33:22 **20** good point for a break.
 14:33:28 **21** **Q.** So you agree with me that if I wanted to
 14:33:31 **22** know when you changed the time step, I would need the
 14:33:35 **23** files.
 14:33:38 **24** **A.** Or I would have to tell you.
 14:33:39 **25** **Q.** But you don't know, sitting here today.

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14:33:42 **1** **A.** I don't recall at what point I changed the
 14:33:44 **2** time step.
 14:33:44 **3** **Q.** Okay.
 14:33:45 **4** **A.** I recall changing the time step, but not at
 14:33:47 **5** what point.
 14:33:48 **6** **Q.** Okay. So the only way that I would be able
 14:33:50 **7** to know is if we had the files to look at and looking
 14:33:52 **8** at the TRN files to see what the time step was.
 14:33:55 **9** **A.** That is correct.
 14:33:55 **10** **Q.** Okay. So since we don't have the files, we
 14:34:12 **11** don't know.
 14:34:15 **12** **A.** What don't you know?
 14:34:16 **13** MR. GOSS: Asked and answered.
 14:34:17 **14** **Q.** When the time steps --
 14:34:18 **15** When and if the time steps were changed.
 14:34:20 **16** **A.** Incorrect.
 14:34:21 **17** You know that the time steps were changed
 14:34:23 **18** because I've said that. And in fact the 264 if it
 14:34:29 **19** just ran out .01 seconds, the time would have been
 14:34:33 **20** different from the actual time of the TRN. So you
 14:34:36 **21** know the time steps were changed, but I cannot tell
 14:34:38 **22** you, sitting here, when the time steps were changed.
 14:34:41 **23** **Q.** Say that again about running the TRN
 14:34:43 **24** forward?
 14:34:44 **25** **A.** No.

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14:34:45 **1** **Q.** The time would have been different from the
 14:34:46 **2** actual time?
 14:34:47 **3** **A.** No.
 14:34:47 **4** What I said is, we know the time step was
 14:34:51 **5** changed.
 14:34:52 **6** **Q.** How do we know that?
 14:34:53 **7** **A.** You know it for two reasons. One, you know
 14:34:55 **8** it because I --
 14:34:56 **9** **Q.** I don't know anything.
 14:34:57 **10** So why do you know that?
 14:34:58 **11** **A.** I'm going to tell you. There's two reasons:
 14:35:00 **12** One, I've testified under oath that that's the case.
 14:35:02 **13** And two, I've given you the 264 time -- TRN file.
 14:35:07 **14** If that entire run was made with a time step
 14:35:11 **15** of .01, then the time associated with that TRN file
 14:35:15 **16** would be 2.64 seconds, and it's not.
 14:35:19 **17** **Q.** Okay, sir, I think we're talking two
 14:35:21 **18** different things here. I'm talking the time step
 14:35:24 **19** between 264 and 2500.
 14:35:28 **20** Do you have any evidence that you changed
 14:35:30 **21** the time step from .01 to anything else?
 14:35:33 **22** MR. GOSS: Between 264 and?
 14:35:37 **23** MR. ASSAAD: 2500.
 14:35:38 **24** **A.** I have my recollection, but I didn't record
 14:35:40 **25** when I changed the time step.

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14:35:41 **1** Q. And what did you change the time step to?
 14:35:43 **2** A. I would have used multiple time steps as --
 14:35:45 **3** and I would have gone down to .0001 seconds.
 14:35:49 **4** Q. What other time steps did you use besides
 14:35:52 **5** .0001?
 14:35:53 **6** A. It -- I would be guessing, but I would say I
 14:35:55 **7** probably used .01, .001, .0001.
 14:36:00 **8** Q. But sitting here today you don't know at
 14:36:03 **9** what time step you made the change.
 14:36:04 **10** A. That is correct.
 14:36:05 **11** Q. And if you made the change, you don't know
 14:36:07 **12** what changes you made at what time steps.
 14:36:10 **13** A. That is correct.
 14:36:27 **14** Q. Why did you change the time steps?
 14:36:30 **15** A. You want to find results that are
 14:36:32 **16** independent of time step.
 14:36:35 **17** Q. Changing the time steps should not cause
 14:36:38 **18** your results to crash, though.
 14:36:40 **19** A. It could.
 14:36:41 **20** Q. Why would it crash?
 14:36:43 **21** A. If the time steps are too large, the
 14:36:47 **22** solution could crash.
 14:36:51 **23** Q. Well I represent to you that we ran it from
 14:36:53 **24** 264 to 951 and it did not crash until 951. Do you
 14:37:00 **25** have an explanation for that?

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14:37:01 **1** A. Yes.
 14:37:01 **2** Q. What's your explanation?
 14:37:04 **3** A. It takes -- There's no reason a -- I'm
 14:37:10 **4** trying to think of how to explain this.
 14:37:11 **5** If you have a time step that is too large it
 14:37:17 **6** doesn't mean the run is going to fail immediately. It
 14:37:20 **7** might fail immediately, but it might fail far off down
 14:37:23 **8** the road in time. So I don't know of any way to
 14:37:27 **9** predict when a computer code will crash based on the
 14:37:30 **10** time step.
 14:37:58 **11** MR. ASSAAD: Let's take a break.
 14:38:00 **12** THE REPORTER: Off the record, please.
 14:38:02 **13** (Recess taken from 2:38 to 2:50 p.m.)
 14:50:08 **14** BY MR. ASSAAD:
 14:50:16 **15** Q. Going back to Exhibit Number 14. You
 14:50:29 **16** testified that TRN number 264, at that point in time
 14:50:44 **17** it reached quasi-steady state; correct?
 14:50:46 **18** A. Yes.
 14:50:49 **19** Q. If you're at quasi-steady state, what
 14:50:51 **20** changes are occurring between 264 and 951 that would
 14:51:03 **21** cause the CFD to crash if you used a .01 time step?
 14:51:08 **22** A. If .01 second time step is small enough to
 14:51:14 **23** ensure stability, there should be no changes, or the
 14:51:17 **24** changes should be minimal.
 14:51:19 **25** Q. Well we're at quasi-steady, correct, by 264?

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14:51:23 **1** A. Yes.
 14:51:23 **2** Q. Okay. So there's very little change between
 14:51:28 **3** 264, 265, 266; correct?
 14:51:31 **4** A. If the calculations are done correctly, then
 14:51:33 **5** correct.
 14:51:35 **6** Q. Well we're using ANSYS. Are you saying
 14:51:37 **7** they're not doing the calculations correctly?
 14:51:38 **8** A. That's not what I said.
 14:51:40 **9** Q. You said "if the calculations are done
 14:51:41 **10** correctly."
 14:51:42 **11** A. Yes.
 14:51:43 **12** Q. What calculations?
 14:51:44 **13** A. The calculations that march forward in time.
 14:51:48 **14** So, for example, even within ANSYS there are choices
 14:51:51 **15** to be made, and as long as you make correct choices,
 14:51:55 **16** and if the calculations are stable, then I would
 14:51:58 **17** expect no meaningful changes from 264 on.
 14:52:01 **18** Q. Okay. So if everything was kept the same
 14:52:03 **19** and you just ran your 264 forward there would be no
 14:52:08 **20** changes except it running forward; correct?
 14:52:11 **21** MR. GOSS: Object to form.
 14:52:12 **22** A. Yeah, I don't know if I would agree to that.
 14:52:15 **23** Q. Well you remember testifying in your general
 14:52:17 **24** cause and earlier today that with the 264 -- with one
 14:52:21 **25** TRN file you could run it forward because you have all

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14:52:24 **1** the information available?
 14:52:25 **2** A. That's right.
 14:52:25 **3** Q. Okay. So I represent to you the only thing
 14:52:31 **4** that we did was run it forward, we didn't change
 14:52:33 **5** anything, and it crashed at 951. Now if it's at
 14:52:37 **6** quasi-steady, what is changing to cause it to crash at
 14:52:40 **7** time step 951?
 14:52:42 **8** A. Let me explain.
 14:52:45 **9** When you march forward in time you have to
 14:52:48 **10** make sure that your time steps are small enough to
 14:52:51 **11** ensure stability, and this is called the Courant
 14:52:55 **12** condition.
 14:52:55 **13** Q. You picked the .01 time step for 264;
 14:52:58 **14** correct?
 14:53:00 **15** A. The .01 --
 14:53:01 **16** Q. "Yes"?
 14:53:02 **17** You picked .01; correct?
 14:53:04 **18** A. The 264 time step corresponded to a .01 time
 14:53:08 **19** step.
 14:53:09 **20** Q. And that's something that you chose?
 14:53:10 **21** A. That is correct.
 14:53:11 **22** Q. Okay. You can move on.
 14:53:16 **23** MR. GOSS: You can finish your answer, if
 14:53:18 **24** you weren't finished.
 14:53:20 **25** A. So as I testified earlier, I chose many time

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14:53:27 **1** steps, and in fact we know that some of those time
 14:53:29 **2** steps are smaller than .01. In fact they were as
 14:53:34 **3** small as .0001. The Courant number that I see on this
 14:53:40 **4** page, the maximum Courant number is 26.31. That is
 14:53:46 **5** above the stability criteria for CFD. So if I were
 14:53:50 **6** running this case I would not blindly continue to run
 14:53:54 **7** with a .01 time step, I would look at the actual
 14:53:57 **8** calculations and I would use my judgment as to when --
 14:54:01 **9** whether the time step should be made smaller.
 14:54:05 **10** **Q.** Now could you answer my question?
 14:54:07 **11** My question is: If you're at quasi-steady
 14:54:09 **12** state at 264, which means there's very little change
 14:54:14 **13** from time step to time step; correct?
 14:54:17 **14** **A.** That is correct.
 14:54:18 **15** **Q.** If any change; correct?
 14:54:19 **16** **A.** Correct.
 14:54:22 **17** **Q.** What would cause your model to crash at time
 14:54:29 **18** step 951 if nothing is changed from your 264 time step
 14:54:36 **19** and we just ran it forward, if it's in quasi-steady?
 14:54:41 **20** **A.** We have to separate the issue of
 14:54:43 **21** quasi-steady and stable. Those are not the same, and
 14:54:46 **22** I think that you're conflating the two.
 14:54:48 **23** You can have a quasi-steady result that then
 14:54:51 **24** you march forward in time in an unstable manner and it
 14:54:54 **25** will crash. You can have an unsteady calculation
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14:54:58 **1** that's not quasi-steady that you run forward in time
 14:55:01 **2** and do it appropriately that doesn't crash. So those
 14:55:04 **3** two things aren't the same.
 14:55:05 **4** **Q.** Because you agree with me that LES is
 14:55:07 **5** transient, and there's always changes over time.
 14:55:11 **6** **A.** I agree LES is transient.
 14:55:13 **7** **Q.** Now when was the last time you looked at the
 14:55:36 **8** ANSYS files for the 505?
 14:55:42 **9** **A.** I don't recall.
 14:55:42 **10** **Q.** Did you review them in preparation of
 14:55:44 **11** today's deposition?
 14:55:47 **12** **A.** I don't believe I did. I don't recall
 14:55:48 **13** reviewing the ANSYS files, --
 14:55:49 **14** **Q.** Did you --
 14:55:50 **15** **A.** -- but I don't remember.
 14:55:51 **16** **Q.** Did you review any of your models?
 14:55:55 **17** **A.** You know, actually I -- maybe I did review
 14:55:56 **18** the 505. I think I reviewed the 505 results prior to
 14:56:03 **19** the deposition.
 14:56:52 **20** **Q.** Do you know what the inlet velocity of the
 14:56:55 **21** air was used from the diffusers, what the velocity
 14:56:58 **22** was?
 14:56:59 **23** MR. GOSS: In his 505 model?
 14:57:00 **24** MR. ASSAAD: Yes.
 14:57:02 **25** **A.** Can I turn to my report --
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14:57:04 **1** **Q.** Of course.
 14:57:06 **2** **A.** -- to see if it was listed there?
 14:57:10 **3** I see I gave the flow rate. I don't see the
 14:57:15 **4** velocity given, but I did give the flow rate.
 14:57:18 **5** **Q.** I represent to you that the velocity -- the
 14:57:20 **6** mean velocity of the inlet was .177 meters per second.
 14:57:24 **7** Does that sound about right?
 14:57:25 **8** **A.** Yes, it does.
 14:57:26 **9** **Q.** Okay. Do you know what the distance is
 14:57:33 **10** between the ceiling and the floor in the operating
 14:57:35 **11** room?
 14:57:36 **12** **A.** Not without referring to my geometry, I
 14:57:39 **13** don't know.
 14:57:40 **14** **Q.** I'll represent to you that it's 3.05 meters.
 14:57:42 **15** Does that sound about right?
 14:57:44 **16** **A.** Yes.
 14:57:46 **17** **Q.** You ran the model for 5.07 seconds; correct?
 14:57:53 **18** **A.** That is the simulation time.
 14:57:55 **19** **Q.** Okay. How far would the air go in five
 14:57:59 **20** seconds, from the ceiling?
 14:58:03 **21** **A.** In five seconds the air would go
 14:58:06 **22** approximately a meter.
 14:58:14 **23** **Q.** Would I just multiply 5.07 times .177?
 14:58:19 **24** **A.** That's right.
 14:58:26 **25** **Q.** I represent to you that it's .897 meters.
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14:58:29 **1** Does that sound about right?
 14:58:30 **2** **A.** That sounds about right.
 14:58:31 **3** **Q.** Okay. What's the distance between the
 14:58:33 **4** ceiling and the top of the operating room table?
 14:58:37 **5** **A.** Perhaps a meter and a half or two meters.
 14:58:40 **6** **Q.** So you agree in five seconds the air that's
 14:58:42 **7** coming in from the inlet doesn't even have enough time
 14:58:45 **8** to reach the top of the operating room table.
 14:58:48 **9** **A.** I think you're confusing simulation time and
 14:58:51 **10** streamline time, flow time.
 14:58:52 **11** **Q.** I'm not --
 14:58:53 **12** I understand the difference. I'm saying
 14:58:54 **13** simulation time.
 14:58:55 **14** **A.** I would agree. In five seconds of
 14:58:57 **15** simulation time the air from the ceiling would not
 14:59:00 **16** have hit the patient or the operating room table.
 14:59:19 **17** **Q.** Do you recall what the mean velocity of the
 14:59:29 **18** exhaust of the Bair Hugger blanket is?
 14:59:32 **19** **A.** I recall the -- the flow rate, but I don't
 14:59:34 **20** recall what the velocity was.
 14:59:35 **21** **Q.** If I tell you, according to your CFD, the
 14:59:37 **22** mean velocity is .12 meters per second, would you
 14:59:41 **23** think that's about right?
 14:59:42 **24** **A.** Yes.
 14:59:46 **25** **Q.** In 5.0 seconds how far would the air that
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14:59:49 **1** left the Bair Hugger blanket go; what distance?
 14:59:55 **2 A.** You said the velocity --
 14:59:57 **3** Remind me of the velocity.
 15:00:00 **4 Q.** Point 12.
 15:00:00 **5 A.** So approximately .6 meters. But again
 15:00:04 **6** that's using simulation time, not flow time.
 15:00:48 **7 Q.** Do you agree with me that ANSYS has the
 15:00:50 **8** capability to track the actual airflow -- not
 15:00:56 **9** streamlines, but airflow, by just continuing the
 15:00:58 **10** simulation for a longer period of time?
 15:01:02 **11 A.** Streamlines are airflow.
 15:01:04 **12 Q.** Streamlines are instantaneous air flows
 15:01:06 **13** based on the tangent of the vectors; correct?
 15:01:09 **14 A.** That is correct.
 15:01:10 **15 Q.** Okay. You could --
 15:01:18 **16** You could have done a simulation for minutes
 15:01:29 **17** simulation time and followed the actual airflow based
 15:01:32 **18** on the air coming from the inlets and see where they
 15:01:40 **19** go without using streamlines; correct?
 15:01:42 **20** MR. GOSS: Object to form.
 15:01:44 **21 A.** Well, I mean, streamlines are the airflow,
 15:01:47 **22** so I think that that's what I did. And in fact for a
 15:01:52 **23** quasi-steady calculation the streamlines are nearly
 15:01:55 **24** equal to the air path lines, so I don't understand the
 15:01:58 **25** distinction or the difference.

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15:02:00 **1 Q.** Okay. Well here's where I have a problem
 15:02:06 **2** with your streamline analogy, is this is a transient
 15:02:10 **3** flow; correct?
 15:02:11 **4 A.** Yes.
 15:02:12 **5 Q.** And the velocity vectors are always
 15:02:14 **6** changing; correct?
 15:02:15 **7 A.** Correct.
 15:02:16 **8 Q.** So a particle that's at a coordinate at time
 15:02:21 **9** zero, it's going to move based on those velocity
 15:02:26 **10** vectors; correct?
 15:02:27 **11 A.** Correct.
 15:02:28 **12 Q.** And the velocity vectors are going to change
 15:02:30 **13** at one; correct?
 15:02:32 **14 A.** Correct.
 15:02:32 **15 Q.** And now you have a different velocity vector
 15:02:35 **16** that was in -- at time one than was at time zero;
 15:02:39 **17** correct?
 15:02:40 **18 A.** That's correct.
 15:02:40 **19 Q.** And the particle is at a different
 15:02:42 **20** coordinate in time; correct?
 15:02:44 **21 A.** That's correct.
 15:02:44 **22 Q.** So now you have different forces on that
 15:02:47 **23** particle that are different than what was at time
 15:02:49 **24** zero.
 15:02:49 **25 A.** Correct.

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15:02:50 **1 Q.** Okay. So since you're in a transient, the
 15:02:54 **2** streamline only tells you where the air would go if
 15:03:00 **3** and only if the velocity vectors did not change.
 15:03:07 **4 A.** If the velo --
 15:03:09 **5** I would say this. I think --
 15:03:10 **6 Q.** Is my statement correct?
 15:03:12 **7 A.** Your statement's confusing.
 15:03:14 **8 Q.** Okay. Let me rephrase it, then. If you
 15:03:16 **9** don't understand it, please let me know.
 15:03:19 **10** The streamline will only show particle flow
 15:03:24 **11** -- and when I say "particle" I'm talking about a
 15:03:26 **12** massless particle -- if and only if the velocity
 15:03:33 **13** vectors don't change over time.
 15:03:37 **14 A.** Not quite true.
 15:03:40 **15** To be exact: If the streamline is
 15:03:45 **16** identically constant over time, then that would be the
 15:03:49 **17** same path that the fluid would take. If the
 15:03:55 **18** streamlines change from one position to another, then
 15:04:00 **19** the particle would take a path that's intermediate of
 15:04:05 **20** those streamlines.
 15:04:06 **21** So I think in your question you said it
 15:04:09 **22** wouldn't -- would only show the particle flow if and
 15:04:15 **23** only if the vectors don't change over time. I -- I
 15:04:18 **24** don't think I would quite agree with that statement.
 15:04:23 **25 Q.** Okay. Let me rephrase it this way, then.

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15:04:29 **1** When you take a snapshot such as the 2540
 15:04:38 **2** TRN file, a frame, you have velocity vectors for every
 15:04:44 **3** single grid cell.
 15:04:48 **4 A.** Yes.
 15:04:49 **5 Q.** Okay. And that doesn't change over time
 15:04:51 **6** because you're not doing anything, you're not moving
 15:04:55 **7** it forward in time.
 15:04:56 **8 A.** Correct.
 15:04:57 **9 Q.** Okay. So --
 15:05:00 **10** And then you add streamlines in; correct?
 15:05:03 **11 A.** Yes.
 15:05:03 **12 Q.** Okay. And you can follow the streamline,
 15:05:07 **13** but that -- that particle path is what you want to
 15:05:09 **14** call it, is only following the velocity vectors for
 15:05:16 **15** that individual TRN file.
 15:05:18 **16 A.** At that instant.
 15:05:20 **17 Q.** Yes.
 15:05:20 **18 A.** Yes.
 15:05:21 **19 Q.** But that doesn't happen in reality, because
 15:05:24 **20** one second from now the velocity vectors change
 15:05:27 **21** because it's a transient model.
 15:05:28 **22 A.** There is a slight variation in the velocity
 15:05:31 **23** vectors, and consequently, in the streamlines.
 15:05:34 **24 Q.** Okay. So you agree with me that in real
 15:05:37 **25** life the streamlines that you've put in your images is

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15:05:41 **1** not where the particles are going to go.
 15:05:42 **2** **A.** I disagree.
 15:05:44 **3** **Q.** You're telling me it's going to follow the
 15:05:46 **4** exact path of the streamline?
 15:05:48 **5** **A.** No.
 15:05:49 **6** **Q.** Okay.
 15:05:49 **7** **A.** Here's -- Here's what I --
 15:05:50 **8** **Q.** And that's my question: It's not going to
 15:05:52 **9** follow the exact path.
 15:05:55 **10** **A.** It would not follow the exact path.
 15:05:57 **11** **Q.** Okay. In your 505 report you refer to a
 15:06:35 **12** Shirozu article to validate your results.
 15:06:38 **13** **A.** Yes.
 15:06:42 **14** **Q.** And if I recall correctly, you indicate that
 15:07:00 **15** the Shirozu results closely matched your calculations;
 15:07:04 **16** is that correct? Page 7, "INDEPENDENT VALIDATION."
 15:07:12 **17** **A.** Yes.
 15:07:20 **18** **Q.** Now you agree with me that you are comparing
 15:07:26 **19** apples and oranges when you're comparing your CFD
 15:07:30 **20** analysis to what Shirozu did.
 15:07:34 **21** **A.** Boy, I don't know what the definition of
 15:07:36 **22** apples and oranges are.
 15:07:37 **23** I would say this: There are some slight
 15:07:39 **24** differences in the Shirozu paper to my study, but
 15:07:42 **25** those are slight differences, and we agree in our
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15:07:46 **1** conclusions.
 15:07:47 **2** **Q.** Well we're talking about two different
 15:07:52 **3** operating rooms here, aren't we?
 15:07:53 **4** (Interruption by the reporter.)
 15:07:53 **5** **A.** That is true.
 15:07:54 **6** **Q.** You agree with me that in Shirozu the air
 15:07:56 **7** exchange was 58 air exchanges per hour.
 15:08:00 **8** **A.** Can you show me the Shirozu reference so I
 15:08:03 **9** can see?
 15:08:03 **10** **Q.** Well do you -- do you recall having a higher
 15:08:06 **11** air change rate per hour?
 15:08:09 **12** **A.** I don't recall the air change rate per hour,
 15:08:11 **13** but if you just show me the paper I'd be happy to see
 15:08:14 **14** it.
 15:08:14 **15** **Q.** And I will, we'll get to it in a second.
 15:08:17 **16** Do you recall what the temperature of the
 15:08:18 **17** Bair Hugger was?
 15:08:18 **18** **A.** I --
 15:08:20 **19** Yes, I do.
 15:08:21 **20** **Q.** What was it?
 15:08:22 **21** **A.** 38 Celsius.
 15:08:23 **22** **Q.** Okay. And that's different than what's been
 15:08:25 **23** -- that's different than 43 Celsius that was used in
 15:08:30 **24** your CFD simulation.
 15:08:31 **25** **A.** Yes, it is different.
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15:08:50 **1** (Abraham Exhibit 15 marked for
 15:08:50 **2** identification.)
 15:08:50 **3** BY MR. ASSAAD:
 15:09:05 **4** **Q.** What's been marked as Exhibit 15 is titled,
 15:09:08 **5** effects of forced air warming on airflow around the
 15:09:10 **6** operating room table.
 15:09:12 **7** Is this the Shirozu article that you're
 15:09:13 **8** referring to in your report?
 15:09:14 **9** **A.** Yes.
 15:09:26 **10** **Q.** I want you to go to the last page, page 84.
 15:09:32 **11** The last paragraph it states: "It was reported that
 15:09:38 **12** excess heat (43 degrees Celsius) from FAW resulted in
 15:09:42 **13** the disruption of ventilation airflows over the
 15:09:45 **14** surgical site because the release of excess thermal
 15:09:48 **15** energy can establish temperature gradients that impede
 15:09:51 **16** the downward flow of ultra-clean air."
 15:09:54 **17** Did I read that correctly?
 15:09:55 **18** **A.** You read that sentence correctly.
 15:09:57 **19** **Q.** It continues on: "This temperature setting
 15:09:59 **20** might provide different results from our study and
 15:10:02 **21** previous studies."
 15:10:03 **22** Did I read that correctly?
 15:10:05 **23** **A.** Yes, you did.
 15:10:06 **24** **Q.** So you would agree with me that these
 15:10:08 **25** authors are not making the conclusion that when the
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15:10:13 **1** Bair Hugger setting is at 43 degrees Celsius that it
 15:10:16 **2** would not affect ultraclean airflow.
 15:10:19 **3** **A.** They say what they wrote, and they say it
 15:10:21 **4** might provide different results.
 15:10:23 **5** **Q.** Okay. So they're not -- they're not saying
 15:10:25 **6** --
 15:10:25 **7** So my point is, they're not concluding that
 15:10:27 **8** the Bair Hugger, at 43 degrees Celsius, would cause no
 15:10:30 **9** disruption in the ultraclean room; correct? They're
 15:10:33 **10** not saying that, are they, sir?
 15:10:35 **11** **A.** I -- I don't think they ever said regardless
 15:10:37 **12** of temperature that there's no disruption. But I --
 15:10:41 **13** In addition, I say that -- I agree with what they
 15:10:44 **14** write.
 15:10:45 **15** **Q.** Okay. You agree with what they write.
 15:10:47 **16** And let's look at the operating room, sir.
 15:10:54 **17** I'd like you to turn to page 80, under "Materials and
 15:11:04 **18** Methods." It states: "The capacity of the air
 15:11:11 **19** conditioning unit of this OR was planned as total
 15:11:14 **20** supply air of 6,000 cubic meters per hour to achieve
 15:11:19 **21** International Standards organization cleanliness class
 15:11:23 **22** 6, resulting in 58.4 air changes per hour."
 15:11:27 **23** Did I read that correctly?
 15:11:30 **24** **A.** Yes, you did.
 15:11:31 **25** **Q.** That is over double the airflow that you
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15:11:34 **1** used in your CFD analysis; correct?

15:11:43 **2** **A.** I don't know. I'd have to do the

15:11:44 **3** calculation.

15:11:45 **4** **Q.** Well if you divided 58.4 by 2 you'd get

15:11:54 **5** 29.2; correct?

15:11:56 **6** **A.** That's correct, except you asked is it the

15:11:58 **7** different airflow, and now you're comparing air

15:12:01 **8** changes per hour.

15:12:02 **9** The airflow rate, remember this is a

15:12:04 **10** different-sized room. So you can't just take the air

15:12:08 **11** exchanges per hour in a vacuum, you have to consider

15:12:11 **12** it with the size of the OR.

15:12:13 **13** And I just have not done the calculations,

15:12:15 **14** so I cannot confirm that it's double, the airflow

15:12:18 **15** rate.

15:12:19 **16** **Q.** The air-exchange rate is over double of what

15:12:21 **17** you used in your CFD analysis; correct?

15:12:25 **18** **A.** I would agree with that.

15:13:04 **19** **Q.** And you agree with me, if you look at page

15:13:07 **20** 81, that the velocity of the air coming from the

15:13:13 **21** laminar airflow was .38 to .45 meters per second,

15:13:21 **22** under "Results."

15:13:24 **23** **A.** I agree that the velocity at the measurement

15:13:28 **24** locations was .38 to .45 meters per second.

15:13:34 **25** **Q.** Which is point --

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15:13:36 **1** And the velocity being used in your CFD

15:13:42 **2** analysis from the inlet air is .177.

15:13:50 **3** **A.** That's the velocity that I used coming out

15:13:52 **4** the vents. And what they're measuring is the velocity

15:13:56 **5** some distance away from the vents.

15:13:59 **6** So they're in a similar location but they're

15:14:00 **7** not exact. And actually this air accelerates as it

15:14:04 **8** goes down into the room. So I would agree that

15:14:06 **9** there's some difference, but I would --

15:14:09 **10** **Q.** "Some difference," or significant

15:14:11 **11** difference?

15:14:12 **12** **A.** I'm not done answering.

15:14:14 **13** I would agree that there is a difference,

15:14:15 **14** there is some difference. But it's hard to compare

15:14:18 **15** this to my results because they're at different

15:14:20 **16** locations.

15:14:21 **17** **Q.** Well, sir, if it's hard to compare this to

15:14:25 **18** your results, how can you indicate, under validation,

15:14:31 **19** that their results closely matched your calculations?

15:14:35 **20** **A.** Let me explain. What I am saying is the

15:14:42 **21** velocity that they measured is not at the outlet vent

15:14:49 **22** surface, so I am hesitant to compare the 38 and 45 to

15:14:54 **23** my 1 -- .17.

15:14:57 **24** Now I will agree theirs is higher, but I

15:14:59 **25** will also say you can't make a direct comparison

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15:15:02 **1** because they aren't in the same location. And if you

15:15:04 **2** notice, I never compared my .17 to their .38 or .45.

15:15:09 **3** This paper has three main -- In my mind this paper has

15:15:13 **4** three main differences from my work.

15:15:15 **5** **Q.** Okay. Let me ask --

15:15:16 **6** **A.** But despite those differences the results

15:15:18 **7** are in great agreement.

15:15:19 **8** **Q.** Okay. You write down: "First, their

15:15:21 **9** experimentally measured air speeds (at the head, an

15:15:25 **10** upward airflow of 39 centimeters per second and

15:15:29 **11** downward airflow of 36 to 45 centimeters per second)

15:15:32 **12** closely matched my calculations."

15:15:35 **13** Do you see where I --

15:15:36 **14** **A.** Yes.

15:15:36 **15** **Q.** What calculations are you referring to?

15:15:39 **16** **A.** Those would be the -- the CFD calculations.

15:15:42 **17** **Q.** And what specific calculation?

15:15:44 **18** **A.** Well they are the results from the CFD.

15:15:47 **19** **Q.** Your CFD calculation?

15:15:48 **20** **A.** Umm-hmm.

15:15:49 **21** THE REPORTER: Your answer, please?

15:15:50 **22** **A.** Yes.

15:15:50 **23** **Q.** Okay. So let's go to your CFD calculation.

15:15:52 **24** Where do you --

15:15:53 **25** Where is there 39 centimeters per second or

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15:15:58 **1** anything close to that number with respect to airflow

15:16:03 **2** in your CFD calculations?

15:16:13 **3** **A.** Well I would --

15:16:14 **4** I mean, I would have to open my CFD, and

15:16:16 **5** maybe we will today. But I would look at the downward

15:16:20 **6** airflow in these locations and the upward airflow by

15:16:23 **7** the head and I would compare them.

15:16:26 **8** **Q.** And you think that they're close to 39

15:16:31 **9** centimeters per second?

15:16:33 **10** **A.** I think so.

15:16:34 **11** **Q.** Well you're the one that's saying it

15:16:36 **12** "closely matched my calculations." Do you know

15:16:38 **13** whether or not they are?

15:16:39 **14** **A.** I expect that they are.

15:16:41 **15** **Q.** Okay. So you expect to find your airflow

15:16:44 **16** somewhere in your CFD analysis around 39 centimeters

15:16:48 **17** per second.

15:16:48 **18** **A.** Yes.

15:16:50 **19** **Q.** And a downward airflow of 36 to 45

15:16:53 **20** centimeters per second.

15:16:54 **21** **A.** Yes.

15:16:55 **22** **Q.** So you're telling me that the airflow in

15:16:57 **23** your CFD analysis accelerates from the vent of .17

15:17:01 **24** meters per second to 36 to 45 centimeters per second?

15:17:08 **25** **A.** Well what I'm saying is it's going to be in

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15:17:11 1 that range. I expect that we find my calculated
 15:17:13 2 downward airflow above the operating table to be in
 15:17:17 3 that range.
 15:17:18 4 Q. Well how long would it take to accelerate
 15:17:23 5 air from a -- from a diffuser from .17 meters per
 15:17:34 6 second to .36 meters per second?
 15:17:39 7 A. I did not investigate how long that would
 15:17:41 8 take.
 15:17:42 9 Q. Can you give me an estimate?
 15:17:43 10 A. No.
 15:17:45 11 Q. Can you do a calculation right now and get
 15:17:48 12 the answer?
 15:17:49 13 A. I would not want to do a calculation without
 15:17:51 14 referring to fluid textbooks to make sure I got the
 15:17:56 15 right properties and the right equations. I would not
 15:17:58 16 do a calculation on the fly in a deposition.
 15:18:00 17 Q. Well you know what the density of air is, we
 15:18:02 18 could get that off of the CFD; correct?
 15:18:04 19 A. Yes.
 15:18:05 20 Q. And you know what gravity is; correct?
 15:18:07 21 A. I know what gravity is.
 15:18:08 22 Q. Okay. And that's 9.8 meters per second
 15:18:11 23 squared.
 15:18:11 24 A. That's the gravitational acceleration on
 15:18:13 25 earth.

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15:18:13 1 Q. What other forces are causing the air to
 15:18:15 2 accelerate from the diffuser down to the floor?
 15:18:17 3 A. You have three forces that are in action:
 15:18:20 4 One is gravity or buoyancy, one is friction, one is
 15:18:24 5 pressure.
 15:18:32 6 Q. So sitting here today -- Strike that.
 15:18:35 7 Do you have any notes that you compared the
 15:18:38 8 experimentally measured results from Shirozu to your
 15:18:43 9 CFD analysis?
 15:18:44 10 A. I have no notes.
 15:18:45 11 Q. Okay. How did you get the Shirozu article?
 15:18:48 12 A. I don't recall how I got it. It may have --
 15:18:50 13 I -- I don't know.
 15:18:52 14 Q. Did it --
 15:18:53 15 Did the attorneys from 3M provide you this
 15:18:54 16 article?
 15:18:55 17 A. They may have. I don't recall.
 15:18:56 18 Q. Do you know whether or not they were
 15:18:57 19 involved in funding the study?
 15:18:59 20 A. I don't know the answer to that.
 15:19:05 21 Q. Were you aware of this study being conducted
 15:19:08 22 before the -- it was published?
 15:19:10 23 A. No, I was not.
 15:19:24 24 Q. And you agree with me that the Shirozu
 15:19:26 25 article doesn't deal with particles.

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15:19:29 1 A. I would agree.
 15:19:39 2 Q. And looking at page 80, do you know what's
 15:19:44 3 behind the anesthesia drape in that picture in picture
 15:19:48 4 A?
 15:19:50 5 A. I cannot see what's behind the anesthesia
 15:19:53 6 drape in that photograph.
 15:19:56 7 Q. Do you know which Bair Hugger was used in
 15:20:00 8 the Shirozu article?
 15:20:03 9 A. Yes.
 15:20:04 10 Q. Which one?
 15:20:05 11 A. It was a Model 750, with -- and it looks
 15:20:10 12 like they used two blanket models, a 522 and a 585.
 15:20:16 13 Q. Fair enough.
 15:20:16 14 Do you know with respect to the graphs or
 15:20:20 15 the figures of Figure 2 and Figure 3, which model Bair
 15:20:26 16 Hugger blanket they used?
 15:20:48 17 And I'll represent to you that there's no
 15:20:50 18 indication of what they used, so -- unless you have --
 15:20:53 19 A. Well I don't know if that's true. And I am
 15:20:55 20 mistaken, they did use particles.
 15:20:58 21 Q. Where do you see particles?
 15:20:59 22 A. Visualization of airflow.
 15:21:01 23 Q. I'm talking about in their CFD analysis or
 15:21:04 24 their --
 15:21:04 25 A. They didn't do a CFD.

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15:21:06 1 Q. -- their --
 15:21:07 2 Not the CFD, their experimental analysis.
 15:21:09 3 A. Well the visualization is part of their
 15:21:11 4 experimental analysis. They used fine particles
 15:21:16 5 approximately 10 micrometers in diameter, and they
 15:21:20 6 illuminated that with a laser light sheet source.
 15:21:25 7 Q. Would that be an acceptable experiment to
 15:21:27 8 conduct?
 15:21:30 9 A. Boy, I think so. I've -- I've seen laser
 15:21:33 10 light illuminations before, and if they're done right
 15:21:38 11 they can provide very good information.
 15:21:40 12 Q. Okay. No. My question is: With respect to
 15:21:42 13 the type of Bair Hugger blanket that was used, do you
 15:21:47 14 know which ones they used to create the figures of
 15:21:51 15 figure -- Figure 1, Figure 2 and Figure 3?
 15:22:06 16 A. For Figure 1 it appears they used the lower
 15:22:09 17 body blanket, and it's my understanding in the other
 15:22:28 18 figures both blankets were used.
 15:22:32 19 Q. And why is that your understanding?
 15:22:34 20 A. Because they say here, --
 15:22:34 21 Q. What page --
 15:22:36 22 A. -- "an adult" --
 15:22:37 23 Q. What page are you referring to?
 15:22:38 24 A. I'm on page 81.
 15:22:40 25 Q. Okay.

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15:22:40 **1** **A.** "An adult volunteer lay supine on the
 15:22:44 **2** operating table and was covered by lower- or
 15:22:45 **3** upper-body warming blanket and a general surgical
 15:22:50 **4** drape suitable for abdominal surgery or total knee
 15:22:55 **5** arthroplasty." And then they talk about the
 15:22:58 **6** visualization experiments.
 15:23:00 **7** **Q.** I understand that, but do you know, when
 15:23:01 **8** they created the figures and obtained the data, you
 15:23:06 **9** agree with me that's either a lower or upper body;
 15:23:08 **10** correct?
 15:23:11 **11** **A.** It could have been both. I mean, let me
 15:23:12 **12** read it. Let's see.
 15:23:13 **13** **Q.** I mean, it doesn't say lower and underbody,
 15:23:16 **14** it says "lower or upper body"; correct?
 15:23:25 **15** Sir, I don't want to sit here and waste time
 15:23:27 **16** reading this whole article. I mean, you cited it to
 15:23:29 **17** support your report.
 15:23:33 **18** Do you recall one way or the other whether
 15:23:36 **19** or not they used an upper body, lower body or both
 15:23:39 **20** during the experiments?
 15:23:41 **21** **A.** Without reviewing the article I would be
 15:23:43 **22** hesitant to say conclusively whether they used an
 15:23:48 **23** upper or lower-body blanket.
 15:23:49 **24** **Q.** But any information you would obtain would
 15:23:51 **25** be through the article; correct?

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15:23:52 **1** **A.** That is correct.
 15:23:52 **2** **Q.** And if the article is silent on what Bair
 15:23:55 **3** Hugger blanket they used for each of the experiments,
 15:24:01 **4** that means we will never know unless we contact the
 15:24:05 **5** authors.
 15:24:08 **6** **A.** If the article is silent, then I would want
 15:24:10 **7** to contact the authors.
 15:24:13 **8** **Q.** Are you aware that the underbody blanket has
 15:24:16 **9** just been recalled by 3M?
 15:24:19 **10** **A.** Do you mean "lower body" or "under body"?
 15:24:22 **11** **Q.** I'm sorry. "Lower body."
 15:24:23 **12** **A.** I am not aware of any recalls.
 15:24:27 **13** **Q.** Do you know whether or not this lower body
 15:24:29 **14** blanket that was used in this case was recalled by 3M?
 15:24:32 **15** **A.** I do not know.
 15:25:09 **16** **Q.** So just so I understand your independent
 15:25:12 **17** validation paragraph in Exhibit Number 1, it is your
 15:25:17 **18** opinion that the velocities measured at the -- at the
 15:25:26 **19** head of the patient closely matches your velocities in
 15:25:34 **20** your CFD analysis.
 15:25:38 **21** **A.** Yes, that is true.
 15:25:39 **22** **Q.** Now when you say the head of the patient,
 15:25:41 **23** are we talking about the exhaust from the Bair Hugger,
 15:25:45 **24** or the head right above the head?
 15:25:51 **25** **A.** I don't know how you'd separate those.

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15:25:53 **1** **Q.** Well I'm asking you at what point, what's
 15:25:58 **2** your data point?
 15:25:59 **3** **A.** Well my data point is this paper, and it's
 15:26:01 **4** Figure 2(B), and they show a velocity of 39 near the
 15:26:07 **5** head.
 15:26:07 **6** **Q.** I'm talking about your data point in your
 15:26:10 **7** CFD analysis when you say it's -- it matches your
 15:26:13 **8** calculations.
 15:26:14 **9** **A.** I would have looked at that -- the
 15:26:16 **10** corresponding region, and I would have compared my
 15:26:18 **11** results to theirs.
 15:26:45 **12** **Q.** So you'll agree that the Bair Hugger causes
 15:26:49 **13** -- Strike that.
 15:26:50 **14** Are you looking at Figure 2?
 15:26:54 **15** **A.** In the --
 15:26:55 **16** **Q.** Shirozu?
 15:26:56 **17** **A.** Yes.
 15:26:57 **18** **Q.** So that's the data you're referring to?
 15:26:58 **19** **A.** Yes.
 15:27:00 **20** **Q.** Okay. And sitting here today, do you know
 15:27:03 **21** whether or not they use an upper-body or lower-body
 15:27:09 **22** blanket to create Figure 2?
 15:27:10 **23** **A.** Without reviewing the article in detail, I'm
 15:27:13 **24** not prepared to answer that question.
 15:27:15 **25** **Q.** Well I think that'd be a very important

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15:27:17 **1** question, wouldn't it, with respect to direction of
 15:27:21 **2** airflow; correct?
 15:27:22 **3** **A.** Not necessarily.
 15:27:24 **4** **Q.** Well you do understand that the underbody
 15:27:26 **5** blanket blows air upwards.
 15:27:30 **6** MR. GOSS: Are we talking about "underbody"
 15:27:32 **7** or "upper body"?
 15:27:33 **8** MR. ASSAAD: Under body, the lower body
 15:27:35 **9** blanket.
 15:27:36 **10** **A.** I don't think you're right. There are
 15:27:38 **11** underbody and lower body blankets, and those aren't
 15:27:40 **12** the same thing.
 15:28:03 **13** And in fact it's clear here on page 81 in
 15:28:06 **14** the exhibit, "An adult volunteer lay supine on the
 15:28:11 **15** operating table and was covered by lower- or
 15:28:14 **16** upper-body warming blanket," and they missed the S,
 15:28:17 **17** but that's okay. So these are above body blankets,
 15:28:20 **18** they are not below body blankets.
 15:28:43 **19** **Q.** You agree with me that the lower body
 15:28:46 **20** blanket was Model 585?
 15:28:55 **21** **A.** I agree.
 15:28:57 **22** **Q.** The Model 585 is an arthrotomy underbody
 15:29:02 **23** blanket, according to 3M's website. Would you
 15:29:04 **24** disagree with 3M's website?
 15:29:06 **25** **A.** I would not disagree with 3M's website.

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15:29:08 **1** Q. Okay.

15:29:08 **2** A. But they used it as an up -- an above body

15:29:11 **3** blanket.

15:29:12 **4** Q. And your basis?

15:29:13 **5** A. The statement that I just read.

15:29:14 **6** Q. I wasn't paying attention because I was

15:29:16 **7** reading.

15:29:17 **8** A. Okay. I'll read it again.

15:29:19 **9** Q. Please do.

15:29:20 **10** A. It's page 81: "An adult volunteer lay

15:29:25 **11** supine on the operating table and was covered by

15:29:30 **12** lower- or upper-body warming blanket's.

15:29:33 **13** So they clearly used these blankets in the

15:29:36 **14** above body manner.

15:29:43 **15** Q. Well if the 585 is an underbody blanket, are

15:29:48 **16** you aware of whether or not you could use it as a

15:29:53 **17** lower-body blanket with -- and put it on top?

15:30:00 **18** A. I think you're confusing "lower" and "upper"

15:30:02 **19** with "under" and "over."

15:30:04 **20** Would you re-ask your question?

15:30:05 **21** Q. Ell can an underbody blanket be used as a

15:30:07 **22** blanket that goes over you; do you know one way or the

15:30:10 **23** other?

15:30:11 **24** A. Yes, I do.

15:30:14 **25** Q. Do you know the dimensions of the underbody

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15:30:16 **1** blanket?

15:30:17 **2** A. I do not know the dimensions of the lower

15:30:21 **3** body blanket.

15:30:23 **4** Q. Well let's just use the term "Model 585,"

15:30:26 **5** because it seems that these authors consider it a

15:30:30 **6** lower-body blanket, and 3M defines it as an underbody

15:30:36 **7** blanket. So let's just use the Model 585. Fair?

15:30:38 **8** A. Fair.

15:30:39 **9** Q. Do you know the dimensions of the Model 585?

15:30:41 **10** A. I do not.

15:30:46 **11** Q. Do you know --

15:31:13 **12** Do you know whether or not the air entering

15:31:15 **13** the room was laminar?

15:31:19 **14** MR. GOSS: Object to form.

15:31:21 **15** A. Yes, I --

15:31:22 **16** Q. In the Shirozu?

15:31:23 **17** A. Yes, I do.

15:31:24 **18** Q. And what's the answer to that?

15:31:25 **19** A. The answer is the air for all of these

15:31:28 **20** operating rooms is really turbulent. They may call

15:31:30 **21** them in industry laminar airflow, but they are always

15:31:33 **22** turbulent.

15:32:45 **23** Q. And you agree with me that in the Shirozu

15:32:49 **24** article they did not have a surgical staff or

15:32:55 **25** anesthesiologists in their modeling or in their

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15:32:58 **1** experiments.

15:32:58 **2** A. I don't know that. I would have to review

15:33:00 **3** the article.

15:33:09 **4** Q. But if I represent to you there's no

15:33:11 **5** indication that they had a surgical team during the

15:33:15 **6** measurements, you wouldn't -- you have no reason to

15:33:19 **7** disagree with that; correct? You would rely on what

15:33:22 **8** the article says.

15:33:22 **9** A. I would rely on what the article says.

15:33:29 **10** Now what they say is, on page 84, the first

15:33:36 **11** full paragraph, second sentence -- third sentence:

15:33:39 **12** "...we did not simulate the movement of surgical,

15:33:42 **13** nursing, and other OR staff during the study."

15:33:47 **14** So it may be that they had surgical staff

15:33:49 **15** there not moving, or maybe they had mannequins, so

15:33:55 **16** it's silent after that.

15:33:57 **17** Q. So you don't know one way or the other

15:33:59 **18** unless you -- you're going to rely on what the article

15:34:01 **19** states; correct?

15:34:02 **20** A. I am going to rely on what the article

15:34:04 **21** states.

15:34:04 **22** Q. Okay. And the article speaks for itself;

15:34:06 **23** correct?

15:34:06 **24** A. The article speaks for itself.

15:34:18 **25** Q. With respect to your 2540 -- Strike that.

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15:34:23 **1** With respect to your 505 model, did at any

15:34:28 **2** time you changed from using Boussinesq approximation

15:34:31 **3** to Ideal Gas law?

15:34:33 **4** A. I don't recall ever changing that.

15:34:35 **5** Q. Can you change that midway?

15:34:36 **6** A. Yes.

15:34:38 **7** Q. Why would one want to change that midway?

15:34:41 **8** A. I don't know why someone would want to

15:34:43 **9** change that midway.

15:34:54 **10** Q. Going back to Exhibit 1. If you look at

15:35:13 **11** page 2 of your publication -- I'm sorry. Exhibit 3.

15:35:24 **12** Now Exhibit -- on page 3 of your

15:35:39 **13** publication, those are the same images as page 2 in

15:35:44 **14** your report; correct?

15:35:46 **15** A. That is correct.

15:35:47 **16** Q. Now that geometry that's used in your

15:35:55 **17** publication and your report is not the same geometry

15:35:57 **18** that was used in your CFD analysis; correct?

15:36:00 **19** A. Not quite true. If you remember from the

15:36:02 **20** last deposition, I said that we began by modeling the

15:36:07 **21** flow actually in the exhaust vents, up into the wall,

15:36:11 **22** and the final results were produced without those

15:36:14 **23** exhaust vents and we just had the vents on the wall.

15:36:18 **24** That's the only difference I can recall.

15:36:34 **25** Q. And you removed some of the tables and et

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15:36:39 **1** cetera; correct?

15:36:41 **2** **A.** I did remove some of the tables and small

15:36:44 **3** features from the original CAD file that were not

15:36:47 **4** relevant to the flow patterns.

15:36:49 **5** **Q.** Is there anywhere in your publication or

15:36:51 **6** your expert report in this case to indicate to the

15:36:54 **7** reader that the geometry was changed that obtained the

15:37:01 **8** results indicated in the following diagrams?

15:37:04 **9** **MR. GOSS:** Changed from what to what?

15:37:06 **10** Objection.

15:37:07 **11** **Q.** From what's been marked as Figure 1 and

15:37:09 **12** Figure 2.

15:37:12 **13** **MR. GOSS:** Same objection.

15:37:18 **14** **Q.** Let me rephrase it.

15:37:19 **15** Did you mention anywhere in your

15:37:21 **16** publication, or in your report, that you altered the

15:37:24 **17** geometry of Figure 1 and Figure 2 to perform your CFD

15:37:31 **18** analysis?

15:37:32 **19** **MR. GOSS:** Are you talking about before he

15:37:34 **20** ran the CFD, or after?

15:37:36 **21** **Q.** At any time.

15:37:38 **22** **A.** Well I mentioned it in my deposition. I

15:37:43 **23** don't know if it's stated -- I don't know if it's

15:37:49 **24** stated here.

15:37:50 **25** **Q.** You agree with me that the readers of

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15:37:53 **1** *Numerical Heat Transfer* don't have the luxury of

15:37:56 **2** having access to your deposition.

15:38:00 **3** **A.** I would agree to that.

15:38:17 **4** Oh, hold on. I do say it, actually.

15:38:19 **5** Following Figure 3 I do say: "At the exits, which

15:38:25 **6** were formed by wall-mounted ducting, zero values for

15:38:29 **7** the second derivatives of all transported variables"

15:38:31 **8** are employed.

15:38:33 **9** So here I am saying that for the results

15:38:36 **10** that are shown here there was -- the duct did not

15:38:39 **11** extend into the wall.

15:38:41 **12** **Q.** Now for the 2540 file you also produced a

15:39:13 **13** results file; correct?

15:39:14 **14** **A.** That is correct.

15:39:17 **15** **Q.** And also an output file; correct?

15:39:20 **16** **A.** I believe so.

15:39:21 **17** **Q.** What's the difference between the output

15:39:22 **18** file and the results file?

15:39:24 **19** **A.** The results file has the results, and the

15:39:26 **20** output file is a script, just a listing of what

15:39:29 **21** happened.

15:39:31 **22** **Q.** And the results file will have the results

15:39:33 **23** for each of the time steps; correct?

15:39:35 **24** **A.** That's correct.

15:39:35 **25** **Q.** So I think you ran it to 3,000 something and

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15:39:40 **1** it had the results for each of those time steps;

15:39:42 **2** correct?

15:39:43 **3** **A.** I think I saved them every ten time steps.

15:39:45 **4** **Q.** Yeah. Exactly, you're right.

15:39:54 **5** And when were those TRN files created, the

15:39:57 **6** ones after 2540?

15:39:59 **7** **A.** The timestamp would be on them. I don't

15:40:02 **8** recall the exact date.

15:40:27 **9** **MR. ASSAAD:** Let's take a break.

15:40:28 **10** **THE REPORTER:** Off the record, please.

15:40:30 **11** (Recess taken from 3:40 to 3:52 p.m.)

15:52:25 **12** BY MR. ASSAAD:

15:52:36 **13** **Q.** I'm going to use your publication because

15:52:40 **14** the pictures are in color. I'd like you to turn to

15:52:53 **15** the Figure Number 1 of your publication, which is

15:52:59 **16** Exhibit Number 3.

15:53:04 **17** If you look at the model, there is a black

15:53:11 **18** area above the head which is where the Bair Hugger

15:53:16 **19** inlet is on your CFD model; correct?

15:53:20 **20** **A.** I believe that is true.

15:53:21 **21** **Q.** Okay. Did you make any changes to that with

15:53:24 **22** re -- in the 505?

15:53:25 **23** **A.** No.

15:53:26 **24** **Q.** Okay. And we discussed this during your

15:53:34 **25** general cause. Have you seen a Bair Hugger blanket in

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15:53:43 **1** person?

15:53:44 **2** **A.** Yes.

15:53:45 **3** **Q.** Are you aware there is a plastic sheet that

15:53:47 **4** goes over the head?

15:53:50 **5** **A.** I believe there can be a plastic sheet that

15:53:52 **6** goes over the head.

15:53:54 **7** **Q.** Have you seen the videos provided by 3M

15:53:57 **8** about placing the upper-body blanket over a person?

15:54:00 **9** **A.** I have not seen videos.

15:54:03 **10** **Q.** If the plastic sheet is over the head, would

15:54:05 **11** you agree with me that would affect the airflow in

15:54:09 **12** your CFD model?

15:54:11 **13** **A.** It may. I would have to see the plastic

15:54:13 **14** sheets.

15:54:26 **15** **MR. GOSS:** I guess I would just object to

15:54:27 **16** the last question.

15:54:37 **17** **Q.** But you're aware there's a plastic sheet so

15:54:39 **18** you've seen it before.

15:54:42 **19** **A.** I don't know if I have seen the plastic

15:54:44 **20** sheet. I -- If -- My recollection is there may --

15:54:47 **21** there may be one and there may not be one.

15:54:47 **22** [Counsel showing the witness an item.]

15:55:04 **23** **Q.** I'll represent to you that this is a 525

15:55:07 **24** extra large upper-body blanket. It's actually a 523.

15:55:22 **25** Have you seen this plastic sheet before

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15:55:27 **1** today?

15:55:30 **2** **A.** I don't know if I've seen this blanket

15:55:32 **3** before today. I don't recall seeing this plastic

15:55:36 **4** sheet before today.

15:55:37 **5** **Q.** If that plastic sheet is part of the 522

15:55:43 **6** blanket and placed over the head, would that affect

15:55:46 **7** the airflow in your CFD analysis of 505?

15:55:51 **8** **A.** So just --

15:55:53 **9** **MR. GOSS:** I was just going to object. Are

15:55:55 **10** you saying based on what's modeled or what's not

15:55:58 **11** modeled in the 505 model?

15:56:02 **12** **MR. ASSAAD:** I don't understand your

15:56:03 **13** objection. I'm sorry.

15:56:04 **14** **MR. GOSS:** You're asking if there is a

15:56:08 **15** sheet in the blanket, would that affect the airflow

15:56:13 **16** in his model. And I'm just objecting I'm not sure

15:56:16 **17** that that is in his model.

15:56:19 **18** **MR. ASSAAD:** In the 522 model?

15:56:21 **19** **MR. GOSS:** In the 505 model --

15:56:21 **20** **MR. ASSAAD:** Okay.

15:56:22 **21** **MR. GOSS:** -- that he -- that the plastic

15:56:23 **22** sheet, I'm not aware that it is part of the geometry.

15:56:27 **23** **MR. ASSAAD:** I understand that.

15:56:28 **24** **MR. GOSS:** Okay.

15:56:29 **25** **Q.** So you agree with me that the plastic sheet

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15:57:51 **1** movement to the plastic sheet?

15:57:54 **2** **A.** The airflow may cause movement to the

15:57:57 **3** plastic sheet, but that wasn't -- I mean, that's a

15:58:00 **4** very new question. You didn't ask that before. The

15:58:03 **5** airflow may affect the plastic sheet.

15:58:07 **6** **Q.** Might cause it to waver a little bit.

15:58:10 **7** **A.** I would have to see it in operation. I

15:58:12 **8** would have to see if it's tucked. It may. It's

15:58:14 **9** possible it may.

15:58:16 **10** **Q.** But regardless, you didn't take that into

15:58:18 **11** an -- into account in your CFD model; correct?

15:58:20 **12** **A.** It's --

15:58:21 **13** It wouldn't affect my CFD model, the

15:58:23 **14** presence or absence of that sheet.

15:58:29 **15** **Q.** Well that would be a piece of geometry

15:58:31 **16** that's not in your CFD model; correct?

15:58:34 **17** **A.** That is correct.

15:58:52 **18** **Q.** Furthermore, with respect to your CFD Model

15:58:57 **19** 505, you agree with me that since all the air is

15:59:01 **20** coming out of the Bair Hugger inlet, that in reality

15:59:06 **21** that setup would not warm the patient.

15:59:10 **22** **MR. GOSS:** Object to form.

15:59:11 **23** **A.** I disagree.

15:59:14 **24** **Q.** Okay. If all the air is leaving the Bair

15:59:16 **25** Hugger inlet and not going over the arms or the body

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15:56:31 **1** is not part of the geometry in the 505 model.

15:56:33 **2** **A.** I did not include the plastic sheet in my

15:56:35 **3** model.

15:56:36 **4** **Q.** So you agree with me; correct?

15:56:37 **5** **A.** Yes.

15:56:38 **6** **Q.** Okay. If the plastic sheet is placed over

15:56:40 **7** the head of the patient, would that affect the airflow

15:56:46 **8** coming from the inlet of the Bair Hugger in your CFD

15:56:51 **9** model?

15:56:52 **10** **A.** So just so I understand correctly: The

15:57:04 **11** patient is underneath, so the patient's head -- now is

15:57:09 **12** the patient's head in your hypothetical here, or is it

15:57:12 **13** here? [Indicating] Here? Okay.

15:57:16 **14** **Q.** The sheet is over the patient's --

15:57:18 **15** The plastic clear sheet is over the

15:57:20 **16** patient's head.

15:57:21 **17** **A.** Okay. A plastic sheet like this would not

15:57:23 **18** affect my calculations.

15:57:26 **19** **Q.** Would you agree with me that if the air in

15:57:28 **20** the 505 is all coming out of the Bair Hugger inlet,

15:57:38 **21** which is basically the neck of the patient, correct,

15:57:41 **22** and the back of the patient?

15:57:42 **23** **A.** Correct.

15:57:43 **24** **Q.** And that plastic sheet is covering that

15:57:48 **25** area, that the airflow would cause some sort of

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15:59:21 **1** of the patient, how is that going to warm the patient?

15:59:24 **2** **MR. GOSS:** Same objection.

15:59:25 **3** **A.** So the Bair Hugger has an inlet that's on

15:59:30 **4** the machine which is far away from the operating

15:59:33 **5** table, so the Bair Hugger inlet isn't material.

15:59:36 **6** **Q.** I'm talking about the Bair Hugger inlet as

15:59:38 **7** defined in your CFD analysis.

15:59:40 **8** **A.** Okay. That's not the Bair Hugger inlet,

15:59:42 **9** that's the inlet to the room, it's the outlet to the

15:59:45 **10** -- of the Bair Hugger.

15:59:46 **11** **Q.** I understand, but you call -- you call it

15:59:49 **12** the Bair Hugger inlet under your -- I'll get the exact

16:00:03 **13** name.

16:00:03 **14** You agree with me in ANSYS when water --

16:00:06 **15** when air gets entering into the room it's called an

16:00:09 **16** inlet.

16:00:09 **17** **A.** Yes, I agree.

16:00:10 **18** **Q.** Okay. So when I use the term "Bair Hugger

16:00:12 **19** inlet" I'm talking about the air from the Bair Hugger

16:00:15 **20** entering into the room.

16:00:17 **21** **A.** Now I understand that. But that's -- that's

16:00:19 **22** not what I said in my report. For example, I don't

16:00:23 **23** see it in my report, but I call -- I'm on Exhibit 3,

16:00:29 **24** page 3, the last paragraph. "The warm air from the

16:00:37 **25** forced-convection blanket was treated as a second

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16:00:39 **1** inlet to the room." So I just want to make sure we
 16:00:44 **2** are talking about the same thing. I'm not talking
 16:00:45 **3** about the inlet to the Bair Hugger, I'm talking about
 16:00:47 **4** the inlet to the room, and I just wanted to clarify
 16:00:50 **5** that.
 16:00:50 **6** **Q.** And that's what I'm referring to.
 16:00:52 **7** And with respect to your modeling, the way
 16:00:59 **8** you have it set up, all the air that's coming from the
 16:01:04 **9** Bair Hugger is going out of the Bair Hugger inlet into
 16:01:08 **10** the room.
 16:01:09 **11** **A.** That is true.
 16:01:11 **12** **Q.** Okay. And none of it is going over the arms
 16:01:19 **13** of the patient.
 16:01:19 **14** **A.** That is incorrect.
 16:01:22 **15** **Q.** Okay. Where in your -- in your CFD is there
 16:01:30 **16** an inlet of air going over the arms of the patient?
 16:01:35 **17** **A.** That is not in my CFD, but let me explain
 16:01:37 **18** how this product works.
 16:01:39 **19** **Q.** Just so I understand you correctly, there is
 16:01:41 **20** no air in your CFD that's going over the arms of the
 16:01:44 **21** patient; correct?
 16:01:46 **22** **A.** Correct.
 16:01:46 **23** **Q.** Okay.
 16:01:47 **24** **A.** I did not model the air coming out of the
 16:01:50 **25** holes that hits the skin. The air comes out and it
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16:01:54 **1** impacts the skin all the way along the arm and maybe
 16:01:57 **2** along the chest, and I guess if they're in a hip
 16:02:02 **3** replacement it would be like this [indicating].
 16:02:04 **4** That air heats the entire arm. Now that air
 16:02:09 **5** then all migrates upwards via the channels and
 16:02:14 **6** collects and exhausts into the room by the patient's
 16:02:17 **7** head, and that's what I modeled in my CFD.
 16:02:41 **8** (Abraham Exhibit 16 marked for
 16:02:41 **9** identification.)
 16:02:41 **10** BY MR. ASSAAD:
 16:02:54 **11** **Q.** What's been marked as Exhibit 16 is part of
 16:03:00 **12** the results file that you provided to us through
 16:03:08 **13** counsel. Does this look familiar?
 16:03:11 **14** **A.** Yes.
 16:03:12 **15** **Q.** And the reason why I did not produce the
 16:03:14 **16** entire results file is it's about 3,000 pages. Does
 16:03:17 **17** that sound about right?
 16:03:18 **18** **A.** They are large.
 16:03:19 **19** **Q.** Okay. And based on --
 16:03:26 **20** Well, I'm sorry. It's the output file, not
 16:03:29 **21** the results file. I'm sorry. Does that sound about
 16:03:31 **22** right?
 16:03:31 **23** **A.** This is the output file.
 16:03:33 **24** **Q.** Okay. Please correct me when I'm wrong when
 16:03:35 **25** I'm using terminology regarding ANSYS.
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16:03:37 **1** And based on the first couple lines, your
 16:03:44 **2** name is there; correct?
 16:03:46 **3** **A.** Yes.
 16:03:47 **4** **Q.** With the name of the computer that you used;
 16:03:48 **5** correct?
 16:03:49 **6** **A.** Yes.
 16:03:50 **7** **Q.** And it's the date that you ran this;
 16:03:52 **8** correct? Or got this file.
 16:03:57 **9** **A.** Yes.
 16:03:59 **10** **Q.** So these results were obtained on December
 16:04:02 **11** 22nd, 2017; correct?
 16:04:04 **12** **A.** Yes.
 16:04:05 **13** **Q.** And this was after your expert report was
 16:04:07 **14** due in this case; correct?
 16:04:10 **15** **A.** Yes.
 16:04:11 **16** **Q.** And are you relying on any of the data to
 16:04:13 **17** support your opinions of the TRN files that you ra --
 16:04:19 **18** that you ran after -- or on December 22nd, 2017?
 16:04:25 **19** **A.** No.
 16:04:26 **20** **Q.** So it doesn't support your opinions in any
 16:04:28 **21** way.
 16:04:29 **22** MR. GOSS: Object to form.
 16:04:30 **23** **A.** I'm relying on the 2540. These -- Any
 16:04:37 **24** results that I contain -- that I found after that
 16:04:39 **25** would have just confirmed.
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16:04:42 **1** **Q.** Okay. So at trial you're not going to
 16:04:43 **2** mention that you rely or that the results confirmed
 16:04:46 **3** your opinions regarding the 2540; is that true?
 16:04:52 **4** **A.** That question confuses me. Could you re-ask
 16:04:54 **5** it?
 16:04:54 **6** **Q.** At trial you're not going to testify that
 16:04:57 **7** the results of the TRN files obtained on December
 16:05:02 **8** 22nd, 2017 support your opinions in this case.
 16:05:08 **9** **A.** Well I'd say that file 2540 is the basis for
 16:05:13 **10** my opinion. Anything run after that would confirm my
 16:05:17 **11** opinion.
 16:05:19 **12** **Q.** Okay. And that is why --
 16:05:21 **13** And why did you run it forward in December
 16:05:24 **14** of 2017?
 16:05:27 **15** **A.** Well I read the transcript from the Motion
 16:05:30 **16** to Exclude and my understanding is you claimed that
 16:05:35 **17** you didn't -- plaintiffs were not provided enough
 16:05:39 **18** information to reproduce the calculations from the TRN
 16:05:44 **19** file, and so I've demonstrated that you can.
 16:05:51 **20** **Q.** Did you change any setting before you ran it
 16:05:53 **21** forward?
 16:05:55 **22** **A.** I don't recall if I did.
 16:06:01 **23** **Q.** You agree with me that you did not use the
 16:06:10 **24** Boussinesq approximation with respect to the 2540
 16:06:13 **25** based on this document.
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16:06:16 **1** **A.** I don't know if that's true. I would have
 16:06:20 **2** to look at this in detail.
 16:06:21 **3** **Q.** Well if you look under "LIBRARY," under
 16:06:24 **4** "PROPERTIES," "EQUATION OF STATE," it says, "Option =
 16:06:27 **5** Ideal Gas." Correct?
 16:06:29 **6** **A.** That's right. That's correct.
 16:06:30 **7** **Q.** So you used the Ideal Gas model and not the
 16:06:32 **8** Boussinesq model; correct?
 16:06:34 **9** **A.** On December 22nd, yes.
 16:06:35 **10** **Q.** Okay. So you changed from Boussinesq to
 16:06:37 **11** Ideal Gas?
 16:06:38 **12** **A.** I may have changed from Boussinesq to Ideal
 16:06:41 **13** Gas. I don't recall changing it, but I may have.
 16:06:46 **14** **Q.** Well, sir, you are an expert -- you claim to
 16:06:53 **15** be an expert in this case; correct?
 16:06:55 **16** **A.** That is correct.
 16:06:56 **17** **Q.** And part of being an expert is to be -- as
 16:07:00 **18** an engineer is to be accurate; correct?
 16:07:02 **19** **A.** That is correct.
 16:07:02 **20** **Q.** And to keep a log or to keep a summary of
 16:07:06 **21** any changes you might make with respect to your work
 16:07:15 **22** that you did on this case; correct?
 16:07:17 **23** **A.** Not necessary.
 16:07:18 **24** **Q.** You understand from the last deposition that
 16:07:22 **25** I asked you many questions regarding what you did,
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16:07:25 **1** what the time steps are, and what changes you made;
 16:07:28 **2** correct?
 16:07:28 **3** **A.** Yes.
 16:07:29 **4** **Q.** Okay. And you would be expecting the same
 16:07:32 **5** questions today.
 16:07:33 **6** **A.** That is an ex --
 16:07:35 **7** I would expect that.
 16:07:36 **8** **Q.** Okay. So you knew that if you made any
 16:07:38 **9** changes to the 2540 model that I would probably be
 16:07:41 **10** asking about it.
 16:07:42 **11** **A.** I don't know that would be the case.
 16:07:44 **12** **Q.** It would be a very good assumption. Do you
 16:07:46 **13** agree?
 16:07:46 **14** **A.** I can't make an assumption about what you
 16:07:49 **15** would ask in that regard.
 16:07:50 **16** **Q.** So regardless, based on the last deposition
 16:07:53 **17** and the questions I asked you, you did not keep track
 16:07:55 **18** of what changes you made when you ran forward the 2540
 16:07:59 **19** model?
 16:08:00 **20** **MR. GOSS:** Objection, form.
 16:08:01 **21** **Q.** Or the 505 model?
 16:08:02 **22** **A.** I did not keep a log of changes that I would
 16:08:06 **23** have made. I don't recall making the change to the
 16:08:09 **24** Ideal Gas model, I don't recall it, and it doesn't
 16:08:13 **25** matter. It's immaterial to the conclusions.
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16:08:16 **1** **Q.** Well doesn't it change whether or not it's
 16:08:18 **2** the worst-case scenario for -- for the plaintiffs?
 16:08:22 **3** **A.** It changes whether that density term would
 16:08:26 **4** overestimate the density forces.
 16:08:57 **5** **Q.** And again, if you did not delete all the --
 16:09:07 **6** some of the TRN files we would have that information
 16:09:09 **7** of any changes that you made with respect to your CFD
 16:09:13 **8** analysis; correct?
 16:09:14 **9** **MR. GOSS:** Object to form.
 16:09:16 **10** **A.** Well you'd have multiple TRN files so you
 16:09:22 **11** would know any changes made with respect to those
 16:09:24 **12** multiple TRN files.
 16:09:27 **13** **Q.** Simple question, sir. Simple, simple
 16:09:30 **14** question.
 16:09:31 **15** When did you change from the Boussinesq
 16:09:34 **16** approximation to the Ideal Gas?
 16:09:36 **17** **MR. GOSS:** Asked and answered.
 16:09:37 **18** **Q.** If you did.
 16:09:39 **19** **A.** I don't recall.
 16:09:40 **20** **Q.** Okay. You don't know.
 16:09:42 **21** **A.** I don't recall when.
 16:09:44 **22** **Q.** Do you know if you ran the Boussinesq at all
 16:09:47 **23** with respect to the 505?
 16:09:48 **24** **A.** I recall running the Boussinesq model for
 16:09:52 **25** the 505.
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16:09:53 **1** **Q.** For how long?
 16:09:54 **2** **A.** I don't know the answer to that. I mean, as
 16:09:56 **3** I look at this, it clearly says "Air Ideal Gas," which
 16:10:00 **4** is a different way of calculating the buoyant forces,
 16:10:03 **5** we've talked about this many, many times. I don't
 16:10:08 **6** recall whether the change was made here, on December
 16:10:11 **7** 22nd, or whether it was made earlier. I just don't
 16:10:14 **8** recall.
 16:10:15 **9** **Q.** Let's go to page 7, under "BUOYANCY MODEL."
 16:10:23 **10** Under "Option" it states "Buoyant"; correct?
 16:10:26 **11** **A.** Yes.
 16:10:26 **12** **Q.** And that would be consistent with the Ideal
 16:10:28 **13** Gas; correct?
 16:10:29 **14** **A.** Well, and Boussinesq.
 16:10:59 **15** **Q.** Is there anywhere in your report that --
 16:11:03 **16** your 505 report which is Exhibit 1, that you received
 16:11:06 **17** an error from ANSYS when you ran the model?
 16:11:12 **18** **A.** There is no mention of an error from ANSYS
 16:11:15 **19** when I ran the model.
 16:11:16 **20** **Q.** Let's go to page 10. Page 10, bottom box
 16:11:23 **21** states: "ERROR #001100279 has occurred in subroutine
 16:11:33 **22** ErrAction message: WARNING: Use of the central
 16:11:37 **23** difference advection scheme is strongly recommended
 16:11:40 **24** for LES simulations. Another scheme has been used for
 16:11:44 **25** one or more equation classes."
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16:11:46 **1** Did I read that correctly?
 16:11:47 **2 A.** You read that correctly.
 16:11:49 **3 Q.** Do you agree that there's an error code in
 16:11:50 **4** your CFD analysis of Exhibit 16?
 16:11:55 **5 A.** I would agree that there's a warning, and
 16:11:59 **6** there -- the warning is exactly what it says. They
 16:12:03 **7** recommend central difference advection for LES
 16:12:06 **8** simulations, and I -- I mean I'm an expert at these
 16:12:10 **9** things and I determined the central difference
 16:12:14 **10** advection scheme was not necessary. So it's a warning
 16:12:16 **11** which I saw and it was not material so I continued the
 16:12:20 **12** calculation.
 16:12:21 **13 Q.** Why did you think it was not necessary?
 16:12:23 **14 A.** Because central difference schemes for
 16:12:26 **15** advection relate to how the information flows from one
 16:12:31 **16** element to another. Okay. And how fluid flowing
 16:12:35 **17** carries information.
 16:12:37 **18** If your elements are sufficiently small so
 16:12:39 **19** that you have mesh independency, the differencing
 16:12:42 **20** scheme doesn't matter.
 16:12:44 **21 Q.** When did you make the change from central
 16:12:47 **22** difference advection to high resolution?
 16:12:51 **23 A.** I -- I don't know --
 16:12:53 **24 Q.** Did you make a change?
 16:12:54 **25 A.** I don't know when or if.

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16:12:55 **1 Q.** So sitting here today you don't know made
 16:12:56 **2** a -- you don't know whether or not you made a change?
 16:12:58 **3 A.** It wouldn't have been necessary, and I
 16:13:01 **4** wouldn't have recorded when -- when or if a change was
 16:13:04 **5** made.
 16:13:18 **6 Q.** Are there any validation papers that use
 16:13:21 **7** high resolution schemes for LES modeling?
 16:13:27 **8 A.** Well yes.
 16:13:28 **9 Q.** Can you name one?
 16:13:29 **10 A.** Mine.
 16:13:30 **11 Q.** Which one?
 16:13:31 **12 A.** My publication in the *Numerical Heat*
 16:13:34 **13** *Transfer* where we validated against experiments.
 16:13:36 **14 Q.** That used high resolution?
 16:13:38 **15 A.** I would have to go back and check.
 16:13:40 **16 Q.** Well does it, "yes" or "no"?
 16:13:41 **17 A.** I -- I don't recall.
 16:13:42 **18 Q.** Well you just testified, sir --
 16:13:44 **19 A.** I think it --
 16:13:45 **20 Q.** -- that your paper --
 16:13:45 **21** MR. GOSS: Hold on.
 16:13:45 **22 Q.** -- was validation for pa -- for papers that
 16:13:47 **23** use high resolution scheme, you pointed to your paper
 16:13:50 **24** which is Exhibit 3, and then I asked you, did that use
 16:13:54 **25** high resolution, and then you say "I don't know."

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16:13:56 **1 A.** No.
 16:13:56 **2** MR. GOSS: Wait -- Wait for a question.
 16:13:57 **3** Wait for him to ask a question.
 16:13:59 **4 Q.** What's the truth here doctor?
 16:14:00 **5** MR. GOSS: All right.
 16:14:01 **6 Q.** What's the truth?
 16:14:01 **7** MR. GOSS: Let's try a different question.
 16:14:03 **8 Q.** Do you know whether or not you used central
 16:14:08 **9** difference advection in your published paper, or high
 16:14:12 **10** resolution, sitting here today?
 16:14:13 **11** MR. GOSS: You can answer that question.
 16:14:15 **12 A.** I believe I used high resolution, and I'm
 16:14:18 **13** not a hundred percent sure.
 16:14:42 **14** (Abraham Exhibit 17 marked for
 16:14:42 **15** identification.)
 16:14:42 **16** BY MR. ASSAAD:
 16:14:55 **17 Q.** What's been marked as Exhibit 17 is the file
 16:15:04 **18** from the 750 model. I would like you to turn to the
 16:15:10 **19** last page. Do you see where it says, "SOLVER CONTROL:
 16:15:18 **20** ADVECTION SCHEME"?
 16:15:19 **21 A.** Yes.
 16:15:20 **22 Q.** It says "Central Difference" there.
 16:15:22 **23 A.** Yes.
 16:15:23 **24 Q.** Does that refresh your recollection of what
 16:15:25 **25** advection scheme you used in the 750 model?

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16:15:31 **1** MR. GOSS: Is this a file that you -- that
 16:15:33 **2** generated from the 264 TRN?
 16:15:35 **3** MR. ASSAAD: Yes.
 16:15:45 **4 A.** What this file says is that for at least
 16:15:49 **5** some of the advection equations I used the central
 16:15:52 **6** difference scheme.
 16:15:53 **7 Q.** So now you're saying that you went back and
 16:15:56 **8** forth between high resolution and central advection?
 16:15:59 **9** MR. GOSS: Object to form.
 16:16:00 **10 A.** No. What I'm saying is this document says
 16:16:06 **11** at least some of the equations were central
 16:16:09 **12** difference, and this document says that at least one
 16:16:12 **13** was not [indicating].
 16:16:14 **14 Q.** Let me -- I think you're a little bit
 16:16:16 **15** confused here, sir, and I'm going to tell you why.
 16:16:18 **16** Document number Exhibit 17 deals with the
 16:16:21 **17** 750 model. Exhibit Number 16 deals with the 505. So
 16:16:27 **18** we're doing two different modelings here. You
 16:16:30 **19** understand that.
 16:16:31 **20 A.** That's what I understand.
 16:16:32 **21 Q.** Okay. So can you sit here today and
 16:16:36 **22** testify, under oath, that you used the central
 16:16:41 **23** advection scheme when you ran the 505 model?
 16:16:46 **24 A.** What I can testify under oath is that at
 16:16:50 **25** least one -- there are many, many, many equations,

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16:16:53 **1** okay, so we're not talking about a single equation.
 16:16:56 **2** What I can testify under oath is at least one equation
 16:16:59 **3** had a different scheme from the central difference
 16:17:02 **4** scheme, and that's what it says here.
 16:17:04 **5** **Q.** Do you know whether the other equations or
 16:17:08 **6** other time steps used central difference advection
 16:17:13 **7** scheme in the 505 model, --
 16:17:13 **8** **A.** I --
 16:17:15 **9** **Q.** -- sitting here today?
 16:17:16 **10** **A.** No.
 16:17:55 **11** **Q.** You are aware that when you run -- when you
 16:17:59 **12** use ANSYS there is a help screen with respect to their
 16:18:04 **13** ANSYS guidebook or, like, manual.
 16:18:10 **14** **A.** I'm not aware of a help screen.
 16:18:12 **15** **Q.** Are you aware of an ANSYS user guide?
 16:18:15 **16** **A.** Yes.
 16:18:16 **17** **Q.** And if you want to look up or get
 16:18:18 **18** suggestions on certain areas you can look it up and
 16:18:21 **19** it'll explain what it is.
 16:18:23 **20** **A.** Yes.
 16:18:23 **21** **Q.** You understand that.
 16:18:24 **22** (Abraham Exhibit 18 marked for
 16:18:24 **23** identification.)
 16:18:24 **24** BY MR. ASSAAD:
 16:18:34 **25** **Q.** What's been marked as Exhibit 18 is a
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16:18:37 **1** document from ANSYS Release 18.2 which you can see at
 16:18:42 **2** the bottom of the page. Do you see that?
 16:18:44 **3** **A.** Yes.
 16:18:45 **4** **Q.** And it's --
 16:18:46 **5** And it's titled "12.3.1 Spatial
 16:18:52 **6** Discretization." Is that how you pronounce that?
 16:18:55 **7** **A.** Could you...
 16:18:57 **8** Oh yes.
 16:18:59 **9** **Q.** And then 12.3.1.1 talks about momentum;
 16:19:05 **10** correct?
 16:19:06 **11** **A.** Yes.
 16:19:07 **12** **Q.** And the advection scheme deals with
 16:19:09 **13** momentum; correct?
 16:19:10 **14** **A.** Yes.
 16:19:13 **15** **Q.** And if you look at the second paragraph, it
 16:19:16 **16** states: "In order to achieve low numerical
 16:19:19 **17** dissipation, you cannot use the standard numerical
 16:19:23 **18** schemes for convection that were developed for the
 16:19:27 **19** RANS equations (second order upwind schemes, or SOU)
 16:19:34 **20** which are dissipative by nature."
 16:19:39 **21** Did I read that correctly?
 16:19:39 **22** **A.** Yes.
 16:19:40 **23** **Q.** And you agree with me that a high resolution
 16:19:41 **24** scheme is a Second Order Upwind scheme; correct?
 16:19:45 **25** **A.** I would agree.
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16:19:46 **1** **Q.** Okay. "In contrast, LES is carried out
 16:19:52 **2** using Central Difference...schemes."
 16:19:55 **3** Did I read that correctly?
 16:19:57 **4** **A.** In fact I think I'm going to read the whole
 16:19:59 **5** document so I understand this document.
 16:20:02 **6** **Q.** Have you not seen this document before?
 16:20:04 **7** **A.** I don't recall seeing this document before.
 16:20:22 **8** (Witness reviewing exhibit.)
 16:20:49 **9** **Q.** Have you had time to read the section?
 16:20:51 **10** **A.** I'm not done yet.
 16:20:52 **11** **Q.** Okay. Do you want to take a break to read
 16:20:54 **12** it?
 16:20:55 **13** **A.** No. (Witness reviewing exhibit.)
 16:21:28 **14** Okay. I'm prepared.
 16:21:31 **15** **Q.** According to this document it states, in
 16:21:33 **16** contrast, LES is carried out using central difference
 16:21:36 **17** schemes; correct?
 16:21:38 **18** **A.** Correct, but it goes on.
 16:21:39 **19** **Q.** And that --
 16:21:40 **20** And that is the error that was -- that was
 16:21:42 **21** stated in Exhibit Number 16, that the use of
 16:21:48 **22** "...central difference advection scheme is strongly
 16:21:50 **23** recommended for LES simulations"; correct?
 16:21:53 **24** **A.** You truncated the statement.
 16:21:55 **25** **Q.** Is what I said correct?
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16:21:57 **1** **A.** It is correct and misleading.
 16:21:59 **2** **Q.** Okay.
 16:22:00 **3** **A.** You truncated the statement.
 16:22:01 **4** **Q.** There's no question pending, sir.
 16:22:07 **5** MR. ASSAAD: I want to take a break right
 16:22:09 **6** now.
 16:22:10 **7** THE REPORTER: Off the record, please.
 16:22:11 **8** (Recess taken from 4:22 to 4:32 p.m.)
 16:32:12 **9** BY MR. ASSAAD:
 16:32:47 **10** **Q.** I'd like to go to page -- or Exhibit Number
 16:32:51 **11** 14. And this is with respect to the 750 model, and I
 16:33:00 **12** just want to talk about the max Courant number of
 16:33:04 **13** 26.31. Do you see that?
 16:33:07 **14** **A.** Yes.
 16:33:08 **15** **Q.** And you mentioned that was indicative of
 16:33:12 **16** instability with respect to the CFD equation solving.
 16:33:18 **17** **A.** It may be indicative.
 16:33:20 **18** **Q.** Okay. What --
 16:33:22 **19** What does the max Courant number indicate?
 16:33:26 **20** **A.** There is a stability criteria on it, and I
 16:33:30 **21** think it is the equations are stable if the max
 16:33:36 **22** Courant number is below 1. I don't remember the exa
 16:33:39 **23** -- I think it's 1. What that means is if you have a
 16:33:42 **24** max Courant number above that you just have to watch
 16:33:44 **25** it and see if it's stable or not.
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16:33:47 **1** Q. Okay. So 26.31 may be unstable.
 16:33:52 **2** A. It could be.
 16:33:53 **3** Q. Okay. What about a hundred?
 16:33:55 **4** A. It would be more likely to be unstable.
 16:33:58 **5** Q. What about 500?
 16:33:59 **6** A. More likely.
 16:34:01 **7** Q. At what point would you say it's unstable,
 16:34:04 **8** what max Courant number?
 16:34:05 **9** A. You use the results. You can't just --
 16:34:08 **10** There isn't a defining line in the Courant number that
 16:34:11 **11** says it's stable or unstable. The guidelines are 1 or
 16:34:14 **12** above you've got to watch it, 1 or below you have
 16:34:17 **13** higher confidence it'll be stable.
 16:34:19 **14** Q. Okay. Going to Exhibit Number 16. I'd like
 16:34:26 **15** you to turn to the second-to-last page. And this is
 16:34:45 **16** your output file that you provided to us through a
 16:34:49 **17** subpoena. And it shows a max Courant number of
 16:34:56 **18** 973.49; correct?
 16:34:56 **19** A. Incorrect.
 16:35:03 **20** Q. Oh, it's an acoustic Courant number;
 16:35:06 **21** correct?
 16:35:07 **22** A. Correct.
 16:35:07 **23** Q. What's the difference between the acoustic
 16:35:09 **24** Courant number and the max -- and the regular Courant
 16:35:11 **25** number?

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16:35:13 **1** A. I believe, and this is not with absolute
 16:35:15 **2** certainty, that the acoustic Courant number refers to
 16:35:19 **3** the passage of sound waves. The Courant number, which
 16:35:23 **4** is to the left of that, is what we use to determine
 16:35:26 **5** stability.
 16:36:40 **6** Q. We've also received images of airflow that
 16:36:51 **7** you created for the different time steps. Do you
 16:36:54 **8** recall creating some?
 16:36:55 **9** A. Yes.
 16:36:58 **10** (Abraham Exhibit 19 marked for
 16:37:15 **11** identification.)
 16:37:15 **12** (Discussion off the stenographic record.)
 16:37:16 **13** BY MR. ASSAAD:
 16:37:23 **14** Q. Now Exhibit 19 is a document that was
 16:37:25 **15** provided to us in response to our subpoena. Does this
 16:37:29 **16** document look familiar?
 16:37:30 **17** A. Yes.
 16:37:31 **18** Q. And on the upper left-hand corner it says,
 16:37:35 **19** "Time on Below Table partiles." I assume that's
 16:37:40 **20** supposed to be "particles"; correct?
 16:37:41 **21** A. Correct.
 16:37:42 **22** Q. Now that's a description that you entered
 16:37:46 **23** manually; correct?
 16:37:47 **24** A. Incorrect.
 16:37:48 **25** Well what do you mean by "description"?

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16:37:51 **1** Q. Like "time on below table particles."
 16:37:55 **2** A. Yes. That text I wrote.
 16:37:58 **3** Q. Okay. That wasn't created by ANSYS;
 16:38:00 **4** correct?
 16:38:01 **5** A. Correct.
 16:38:02 **6** Q. And what we're seeing here are streamlines;
 16:38:05 **7** correct?
 16:38:05 **8** A. Correct.
 16:38:08 **9** Q. And it's showing you the streamlines for 60
 16:38:10 **10** seconds; correct?
 16:38:12 **11** A. Correct.
 16:38:12 **12** Q. And this was created in December of 2017;
 16:38:17 **13** correct?
 16:38:18 **14** A. Yes.
 16:38:19 **15** Q. Okay. After your expert report was
 16:38:23 **16** submitted; correct?
 16:38:24 **17** A. Correct.
 16:38:27 **18** Q. And this is what you were saying that you
 16:38:30 **19** are relying upon showing the streamlines for 60
 16:38:34 **20** seconds; correct?
 16:38:35 **21** MR. GOSS: Object to form.
 16:38:36 **22** A. Incorrect.
 16:38:37 **23** Q. You're not relying on any of these images?
 16:38:39 **24** A. No. What I -- I think I said this earlier,
 16:38:42 **25** and I'll -- maybe I didn't say it very clearly.

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16:38:45 **1** For my opinion in the supplemental report
 16:38:47 **2** I'm only relying on the 2540. These extra images are
 16:38:52 **3** just to show that the flow patterns are not changing
 16:38:56 **4** over time. So they confirm my results, but I'm not
 16:38:58 **5** relying upon them.
 16:39:01 **6** Q. Oh, I understand that.
 16:39:05 **7** But I'll represent to you --
 16:39:05 **8** (Abraham Exhibit 20 marked for
 16:39:05 **9** identification.)
 16:39:05 **10** BY MR. ASSAAD:
 16:39:27 **11** Q. -- that Exhibit Number 20 is the graphical
 16:39:32 **12** representation of streamlines for the 2540 TRN file.
 16:39:39 **13** Fair enough?
 16:39:40 **14** MR. GOSS: Is this one that we produced to
 16:39:42 **15** you, or one you generated from the TRN file?
 16:39:46 **16** MR. ASSAAD: This is what you produced to
 16:39:47 **17** me, --
 16:39:47 **18** MR. GOSS: Okay.
 16:39:48 **19** MR. ASSAAD: -- and for the record, you
 16:39:49 **20** produced streamlines at 60 seconds for 2440, 2450,
 16:39:57 **21** 2540, 2750, 3250, 3400, 3500, and 3630.
 16:40:06 **22** Q. Does that sound about right?
 16:40:08 **23** A. Yes.
 16:40:08 **24** Q. Okay. Are you relying on the streamlines
 16:40:11 **25** you prepared for the 2540 to show the 60-second

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16:40:17 **1** streamlines of that particular TRN file?
 16:40:21 **2** **A.** Yes.
 16:40:22 **3** **Q.** And this was created in December of 2017;
 16:40:24 **4** correct?
 16:40:25 **5** **A.** This image was.
 16:40:27 **6** **Q.** Okay. And after your expert report was
 16:40:30 **7** submitted; correct?
 16:40:31 **8** **A.** Correct.
 16:40:39 **9** **Q.** And this was provided to us last week.
 16:40:44 **10** Do you know when this was provided to
 16:40:45 **11** plaintiffs?
 16:40:45 **12** **A.** I do not know.
 16:40:55 **13** **Q.** And you are not going to rely upon, for your
 16:40:58 **14** expert opinion in the Gareis case, on any other
 16:41:06 **15** graphical depictions of streamlines for other time
 16:41:12 **16** steps; correct?
 16:41:13 **17** **MR. GOSS:** Other than 2540.
 16:41:15 **18** **Q.** Yes.
 16:41:16 **19** **A.** Correct.
 16:41:33 **20** **Q.** And you used the term "particles," but these
 16:41:38 **21** are streamlines, not particles; correct?
 16:41:40 **22** **A.** That is correct.
 16:41:42 **23** **Q.** So you would agree with me that the use of
 16:41:44 **24** "particles" is inappropriate in describing this graph;
 16:41:47 **25** correct?

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16:41:52 **1** **A.** It may be. I'd have to think about whether
 16:41:54 **2** it's inappropriate. But these --
 16:41:55 **3** I would say this. These are streamlines.
 16:41:58 **4** **Q.** Okay. You're familiar with the capabilities
 16:43:56 **5** of ANSYS; correct?
 16:43:57 **6** **A.** Yes.
 16:43:58 **7** **Q.** And you are aware that you could take two
 16:44:02 **8** different time steps and ANSYS could graph the delta
 16:44:08 **9** or the change between the two if you want to look at
 16:44:11 **10** velocity or temperature.
 16:44:12 **11** **A.** That may be true. I don't know if that's
 16:44:14 **12** true, but it might be.
 16:44:16 **13** **Q.** So you've never done that?
 16:44:17 **14** **A.** I have never done that.
 16:44:58 **15** (Abraham Exhibit 21 marked for
 16:44:58 **16** identification.)
 16:44:58 **17** BY MR. ASSAAD:
 16:45:12 **18** **Q.** Exhibit 21 is a view looking from -- towards
 16:45:19 **19** the head of your geometry in the 2540 TRN file. Does
 16:45:27 **20** this look familiar?
 16:45:29 **21** **A.** Yes.
 16:45:30 **22** **Q.** Would you agree with me that where it's the
 16:45:32 **23** color red is the Bair Hugger inlet where the exhaust
 16:45:38 **24** air is coming -- is coming out of the Bair Hugger
 16:45:41 **25** blanket in your CFD model?

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16:45:44 **1** **A.** That is the...
 16:45:46 **2** I would say this. That is where the air
 16:45:48 **3** from the Bair Hugger enters the room.
 16:45:50 **4** **Q.** Okay. And that's a two-dimensional plane;
 16:45:55 **5** correct?
 16:45:56 **6** **A.** Yes.
 16:46:16 **7** **Q.** I'm going to represent to you that we
 16:46:18 **8** actually ran your 2540 TRN file forward for a hundred
 16:46:28 **9** seconds of simulation time.
 16:46:51 **10** (Abraham Exhibit 22 marked for
 16:46:59 **11** identification.)
 16:46:59 **12** **MR. GOSS:** I'm going to object as vague to
 16:47:01 **13** "simulation time," because I'm -- I may be confused
 16:47:03 **14** about what that means.
 16:47:05 **15** **Q.** Sir, do you understand when I use the term
 16:47:07 **16** "simulation time"?
 16:47:09 **17** **A.** I am not certain what you mean.
 16:47:12 **18** **Q.** You understand that TRN 2540 had a
 16:47:15 **19** simulation time of 5.07 seconds.
 16:47:20 **20** **A.** If you're using it in that context, then I
 16:47:23 **21** understand "simulation time."
 16:47:28 **22** **Q.** Can we agree that for the purposes of this
 16:47:30 **23** deposition that definition of simulation time can be
 16:47:32 **24** used?
 16:47:33 **25** **A.** Yes.

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16:47:34 **1** **Q.** Okay.
 16:48:16 **2** **MR. ASSAAD:** We need to take a break
 16:48:18 **3** because I need to make sure I have the right pictures
 16:48:21 **4** in front of me and I need to talk to my consultants.
 16:48:25 **5** **THE REPORTER:** Off the record, please.
 16:48:36 **6** (Recess taken from 4:48 to 4:50 p.m.)
 16:50:45 **7** BY MR. ASSAAD:
 16:50:50 **8** **Q.** I want to discuss your mesh that you used in
 16:50:52 **9** the 505.
 16:50:57 **10** (Abraham Exhibit 23 marked for
 16:50:57 **11** identification.)
 16:50:57 **12** BY MR. ASSAAD:
 16:51:19 **13** **Q.** What's been marked as Exhibit 23 is a
 16:51:23 **14** cross-sectional view of your mesh. Do you recognize
 16:51:28 **15** this mesh?
 16:51:32 **16** **A.** I don't recognize this image. I don't know
 16:51:35 **17** exactly where it was taken in the model. It appears
 16:51:40 **18** to be a mesh from -- It may be a mesh from the CAD
 16:51:45 **19** file, but I don't recognize this image.
 16:51:46 **20** **Q.** Well this is a --
 16:51:48 **21** I'll represent to you this is the mesh taken
 16:51:50 **22** from your 2540 file that was provided to us by your
 16:51:53 **23** attorneys.
 16:51:55 **24** **A.** And I understand that. I'm saying I don't
 16:51:57 **25** recognize this image.

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16:52:00 **1** **Q.** Now when I'm looking at this mesh it seems
 16:52:03 **2** like the mesh is more fine in one area over the rest
 16:52:06 **3** of the area. Do you see that?
 16:52:09 **4** **A.** I would say it's more fine in some areas,
 16:52:11 **5** less fine in others.
 16:52:13 **6** **Q.** Okay. You created the mesh; correct?
 16:52:31 **7** **A.** Yes.
 16:52:31 **8** **Q.** And part of creating the mesh is to create a
 16:52:37 **9** finer mesh in areas in which you want to have more, I
 16:52:44 **10** guess for lack of a better term, clarity of what's
 16:52:46 **11** going on?
 16:52:48 **12** **A.** You could say it like that.
 16:52:50 **13** **Q.** Okay. Why did you pick that --
 16:52:51 **14** There's a section there that's a very fine
 16:52:54 **15** mesh, kind of looks like a square, to the left of the
 16:52:57 **16** operating room table. Do you see that? Or rec --
 16:52:59 **17** looks rectangular?
 16:53:00 **18** **A.** Yes.
 16:53:02 **19** **Q.** Why the is the mesh in that area much finer
 16:53:04 **20** than the rest of the air in the operating room?
 16:53:07 **21** **A.** I'm going off memory, which is imperfect,
 16:53:11 **22** but I probably wanted a refined mesh in that area
 16:53:15 **23** where I anticipated Bair Hugger air would be
 16:53:20 **24** exhausted.
 16:53:21 **25** **Q.** Okay. So based on your mesh that was what
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16:53:32 **1** your hypothesis was with respect to where the Bair
 16:53:36 **2** Hugger air was going to be exhausted; correct?
 16:53:38 **3** **A.** No. I think --
 16:53:39 **4** MR. GOSS: Object to form.
 16:53:40 **5** **A.** -- you have it backwards.
 16:53:48 **6** **Q.** Okay. What did I misunderstand?
 16:53:50 **7** **A.** You said based on the mesh that's where I
 16:53:53 **8** expected the Bair Hugger air to be exhausted, and I
 16:53:56 **9** would flip it and say, I expect the Bair Hugger air to
 16:54:01 **10** be exhausted there, therefore I created a finer mesh
 16:54:03 **11** there.
 16:54:04 **12** **Q.** Okay.
 16:54:52 **13** (Abraham Exhibit 24 marked for
 16:54:52 **14** identification.)
 16:54:52 **15** BY MR. ASSAAD:
 16:54:53 **16** **Q.** Exhibit 24 is a temperature gradient of the
 16:54:56 **17** operating room. I don't have the scale on the
 16:55:00 **18** temperature, it's kind of irrelevant to my questions
 16:55:03 **19** here.
 16:55:04 **20** But my question is: You ran the model for
 16:55:08 **21** 5.07 seconds. Why is there heat on the upper
 16:55:20 **22** right-hand side of the operating room when the Bair
 16:55:25 **23** Hugger is exhausting on the left-hand side?
 16:55:27 **24** **A.** There's a simple explanation for that, but I
 16:55:30 **25** first want to correct your question. The temperature
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16:55:33 **1** scale is totally relevant. A proper temperature scale
 16:55:37 **2** would be like one of the ones that I show in my report
 16:55:39 **3** with numbers, and you can see that the temperature
 16:55:43 **4** scale is uniform so every number represents a
 16:55:46 **5** different value of temperature.
 16:55:48 **6** Here, how do we interpret what red, blue,
 16:55:52 **7** green, yellow means? In fact we don't even know if
 16:55:55 **8** the temperature scales are uniform. With that
 16:55:58 **9** statement, the reason -- and in fact in this report,
 16:56:02 **10** and in fact in the first deposition we talked about
 16:56:04 **11** this, why is air near the top of a room warmer than
 16:56:08 **12** air near the bottom, and that is the old adage, heat
 16:56:11 **13** rises. Hot air rises. So if you were to measure or
 16:56:16 **14** calculate the temperature in a room with buoyancy,
 16:56:19 **15** you'd find it warmer at the top, cooler at the bottom,
 16:56:22 **16** just like in this room.
 16:56:24 **17** **Q.** All right. Let's do this. Unfortunately
 16:56:26 **18** everything we printed did not come up with the scale,
 16:56:29 **19** so I'm just going to show it on the big screen.
 16:56:36 **20** (Discussion off the stenographic record.)
 16:56:39 **21** MR. ASSAAD: Another break, and I
 16:56:42 **22** apologize.
 16:56:43 **23** THE REPORTER: Off the record, please.
 16:56:45 **24** (Recess taken from 4:56 to 5:06 p.m.)
 17:06:40 **25** BY MR. ASSAAD:
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17:06:49 **1** **Q.** With respect to the streamlines that you
 17:06:54 **2** placed in your 505 model, am I correct that you began
 17:07:01 **3** streamlines from the exhaust air of the Bair Hugger;
 17:07:09 **4** correct?
 17:07:14 **5** **A.** I began streamlines from two locations.
 17:07:18 **6** **Q.** I understand that, but one of them was from
 17:07:20 **7** the exhaust air of the Bair Hugger; correct?
 17:07:21 **8** **A.** Correct, where the Bair Hugger air entered
 17:07:24 **9** the room.
 17:07:24 **10** **Q.** Yes. Would that --
 17:07:26 **11** Which would be that red area on Exhibit
 17:07:27 **12** Number 21.
 17:07:31 **13** **A.** Yes.
 17:07:32 **14** **Q.** Okay. And the other area would be from
 17:07:36 **15** underneath the operating room table; correct?
 17:07:42 **16** **A.** Correct.
 17:07:43 **17** **Q.** And that would be from where the legs are;
 17:07:45 **18** correct?
 17:07:47 **19** **A.** I can see part of it in this image. Part of
 17:07:51 **20** the zone extends beyond the surgical table
 17:07:53 **21** approximately at the knee or thigh.
 17:07:55 **22** **Q.** So from the knee or thigh back; correct?
 17:07:58 **23** **A.** Well, and it would have gone both
 17:08:01 **24** directions. From this image we don't see how far it
 17:08:04 **25** goes in both directions, but it -- we -- we see the
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17:08:07 **1** part that is by the knee or thigh, we don't see how
 17:08:11 **2** far it extended in the other directions.
 17:08:13 **3** **Q.** Okay. And you agree when air enters the
 17:08:18 **4** operating room it's going to have affect on the entire
 17:08:24 **5** operating-room airflow.
 17:08:27 **6** **A.** I don't know if I would agree with that.
 17:08:29 **7** **Q.** Are there any dead zones in the operating
 17:08:31 **8** room?
 17:08:32 **9** **A.** Define a dead zone.
 17:08:33 **10** **Q.** Where there --
 17:08:34 **11** A recirculation zone, maybe that's a better
 17:08:37 **12** term.
 17:08:37 **13** **A.** Yes. A recirculation zone, though, is not a
 17:08:40 **14** dead zone.
 17:08:41 **15** **Q.** Okay. Are there any recirculation zones in
 17:08:43 **16** the operating room --
 17:08:44 **17** **A.** Yes.
 17:08:44 **18** **Q.** -- in the model?
 17:08:46 **19** Where?
 17:08:49 **20** **A.** If you look to Exhibit 1, Figure 5.
 17:08:55 **21** **Q.** Okay.
 17:08:56 **22** **A.** That figure shows recirculation zones.
 17:08:59 **23** **Q.** Where?
 17:09:00 **24** **A.** The vectors shown there show the direction
 17:09:04 **25** of airflow patterns. The airflow is coming down from
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17:09:08 **1** the ceiling, it washes over the surgical table against
 17:09:11 **2** the wall -- against the floor, sorry, toward the wall,
 17:09:14 **3** and then rises at the wall. So those are eddies,
 17:09:17 **4** those are recirculation zones.
 17:09:18 **5** **Q.** Okay. And there's also a recirculation zone
 17:09:26 **6** underneath the operating room table; correct?
 17:09:28 **7** **A.** That is correct.
 17:09:29 **8** **Q.** Okay. Can you please highlight, on Exhibit
 17:09:35 **9** 1, where there are recirculation zones?
 17:09:49 **10** **A.** (Witness complying.)
 17:10:00 **11** THE WITNESS: Do I need to show you?
 17:10:01 **12** **A.** I don't know if I need to show anyone.
 17:10:04 **13** **Q.** That's fine.
 17:10:05 **14** **A.** Okay.
 17:10:32 **15** **Q.** Now you provided TRN files from 2540 to --
 17:10:45 **16** I'm sorry -- from 2440 to 3630; correct?
 17:10:52 **17** **A.** Correct.
 17:10:52 **18** **Q.** And I'm not saying you provided them all.
 17:10:54 **19** You provided about, you know, a handful; correct?
 17:11:03 **20** **A.** I don't know what "a handful" is. I
 17:11:04 **21** provided many TRN files in that range.
 17:11:08 **22** **Q.** And the last TRN file that you provided was
 17:11:11 **23** time step 3630. Does that sound about right?
 17:11:14 **24** **A.** That sounds about right.
 17:11:15 **25** **Q.** Okay.
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17:11:19 **1** (Abraham Exhibit 25 marked for
 17:11:40 **2** identification.)
 17:11:40 **3** (Discussion off the stenographic record.)
 17:11:41 **4** BY MR. ASSAAD:
 17:11:43 **5** **Q.** I'll represent to you that Exhibit Number 25
 17:11:46 **6** is a comparison between time step 2540 and 3630. And
 17:11:58 **7** sitting here today you were unaware that -- or you're
 17:12:00 **8** not sure whether or not you could do a comparison
 17:12:04 **9** between two time steps in ANSYS.
 17:12:05 **10** **A.** No, I know you can do comparisons. I didn't
 17:12:07 **11** know that you could do a -- that ANSYS would spit out
 17:12:10 **12** a comparison contour graph. I didn't know that this
 17:12:13 **13** was automated.
 17:12:14 **14** **Q.** Okay. And what we're showing here is
 17:12:18 **15** temperature, velocity, and vector change -- changes
 17:12:24 **16** between the 3630 TRN file and the 2540 TRN file.
 17:12:31 **17** Do you understand what I'm saying?
 17:12:32 **18** **A.** Yes.
 17:12:32 **19** **Q.** Okay. And it's only showing deltas. Do you
 17:12:37 **20** understand that?
 17:12:37 **21** **A.** It is showing a temperature difference.
 17:12:39 **22** **Q.** Okay. You agree with me that ANSYS is
 17:12:44 **23** showing a temper -- there is a temperature difference
 17:12:49 **24** in page 1 of Exhibit Number 25 between the 3630 TRN
 17:12:54 **25** file and the 2540 TRN file.
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17:12:56 **1** MR. GOSS: Just object to the lack of
 17:12:58 **2** foundation. You can answer.
 17:12:59 **3** **A.** I would agree, and I even said that it's
 17:13:03 **4** essential. This has to happen in an unsteady flow.
 17:13:06 **5** **Q.** Okay. So you agree with me --
 17:13:07 **6** You don't disagree that there would be a
 17:13:09 **7** temperature difference such as depicted in Exhibit 25.
 17:13:13 **8** **A.** I would agree that there has to be a
 17:13:17 **9** temperature difference between any two TRNs such as
 17:13:20 **10** the one we're seeing here.
 17:13:22 **11** **Q.** Okay. And I represent to you that this is
 17:13:25 **12** not something that we created, this is based off of
 17:13:27 **13** your TRN files that you provided to us or your counsel
 17:13:32 **14** provided to us last week in -- as a response to our
 17:13:34 **15** discovery requests.
 17:13:35 **16** Do you also see, if you turn to the velocity
 17:13:40 **17** graph, that there's also a change over time in
 17:13:48 **18** velocity between the 2630 TRN and the 2540 TRN?
 17:13:56 **19** **A.** And I give the same answer. There has to be
 17:13:58 **20** a small change from one TRN to the other.
 17:14:01 **21** **Q.** Okay. So you agree with me that there's a
 17:14:04 **22** change.
 17:14:05 **23** **A.** I -- I'll do more than that. I'll say there
 17:14:08 **24** has to be a change.
 17:14:10 **25** **Q.** Okay. And you agree with me, if you look at
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17:14:15 **1** page three, that there's also a change in the velocity
 17:14:20 **2** vectors between the 2540 TRN file and the 3630 TRN
 17:14:27 **3** file.
 17:14:28 **4** **A.** And I would say there has to be a change.
 17:14:31 **5** **MR. GOSS:** I'm just going to object just
 17:14:34 **6** because I'm confused about what the difference is
 17:14:37 **7** between page 2 and page 3.
 17:14:40 **8** **Q.** Do you understand the difference between
 17:14:41 **9** velocity value and velocity vector?
 17:14:44 **10** **MR. GOSS:** Oh, I see. Never mind. I
 17:14:47 **11** follow.
 17:14:50 **12** **MR. ASSAAD:** And with all due respect, a
 17:14:52 **13** lack of understanding is not a valid ob -- is not a
 17:14:55 **14** legal objection.
 17:14:55 **15** **MR. GOSS:** Well it sounded vague because I
 17:14:59 **16** didn't understand.
 17:15:00 **17** (Laughter.)
 17:15:01 **18** **MR. GOSS:** Now I understand.
 17:15:02 **19** **MS. ZIMMERMAN:** I'm there with you.
 17:15:04 **20** **MR. GOSS:** All right.
 17:15:27 **21** **Q.** Do you know what the simulation time was for
 17:15:29 **22** the 3630 TRN file?
 17:15:32 **23** **A.** I do not know it off the top of my head.
 17:15:42 **24** **Q.** Now --
 17:15:42 **25** (Abraham Exhibit 26 marked for
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17:17:46 **1** time -- Withdraw that question. I'm getting tired.
 17:17:51 **2** Your simulation time, according to your
 17:17:55 **3** 3630, is 5.1799 seconds. Is there any reason that you
 17:18:00 **4** would disagree with that?
 17:18:00 **5** **A.** No.
 17:18:05 **6** **Q.** I'm sorry. 6.859 seconds. Would you
 17:18:09 **7** disagree with that at all?
 17:18:10 **8** **A.** I would not.
 17:18:11 **9** **Q.** Okay.
 17:18:11 **10** **MR. GOSS:** Just to be clear for the record
 17:18:13 **11** that 6.859 seconds is associated with the 3630 TRN;
 17:18:18 **12** is that right? Or did I get that wrong?
 17:18:29 **13** **MR. ASSAAD:** Yes, the 3630 is 6.7859
 17:18:33 **14** seconds.
 17:18:38 **15** **Q.** So you agree with me that in less than one
 17:18:40 **16** second there is a change in velocity, temperature, and
 17:18:43 **17** velocity vectors.
 17:18:44 **18** **A.** In fact I'll go further. There has to be
 17:18:46 **19** some change.
 17:18:47 **20** **Q.** Okay. Because it's a transient model;
 17:18:49 **21** correct?
 17:18:50 **22** **A.** That is correct.
 17:18:52 **23** **Q.** And you agree with me that velocity vectors
 17:18:54 **24** are going to change the streamlines.
 17:18:57 **25** **A.** Yes.
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17:15:42 **1** identification.)
 17:16:25 **2** (Discussion off the stenographic record.)
 17:16:25 **3** BY MR. ASSAAD:
 17:16:26 **4** **Q.** What's been marked as Exhibit 26, I will
 17:16:30 **5** represent to you, is us running your model forward up
 17:16:40 **6** to six seconds of simulation time.
 17:16:46 **7** So --
 17:16:46 **8** **MR. GOSS:** 2540.
 17:16:48 **9** **MR. ASSAAD:** 2540.
 17:16:50 **10** **Q.** So basically we're looking at the delta
 17:16:52 **11** between 5.07 seconds and 6 seconds. Do you understand
 17:16:57 **12** that?
 17:16:58 **13** **A.** Yes.
 17:16:58 **14** **Q.** Okay. And do you agree with me that you are
 17:17:04 **15** seeing a change in temperature, velocity, and velocity
 17:17:09 **16** vectors in Exhibit 26?
 17:17:13 **17** **A.** I agree that this exhibit shows a difference
 17:17:17 **18** in temperature, velocity, and velocity vector.
 17:17:22 **19** **Q.** Okay. And we're talking about a change in
 17:17:25 **20** less than one second.
 17:17:28 **21** **A.** You're representing that to me, so I take
 17:17:31 **22** you at your word.
 17:17:34 **23** **Q.** And just to let you know --
 17:17:40 **24** Or let me ask you this. Would you disagree
 17:17:42 **25** that if your 3630 TRN file states that the simulation
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17:19:02 **1** (Abraham Exhibit 27 marked for
 17:19:02 **2** identification.)
 17:19:02 **3** BY MR. ASSAAD:
 17:19:19 **4** **Q.** Exhibit 27, I represent to you, is a
 17:19:22 **5** comparison between your 2540 TRN file and a TRN file
 17:19:27 **6** that went out a hundred seconds of simulation time.
 17:19:34 **7** Do you understand that?
 17:19:36 **8** **A.** Because you've told me.
 17:19:37 **9** **Q.** Okay. And if you look at the temperature
 17:19:48 **10** delta, you see that there are more areas of changing
 17:19:51 **11** temperature than the other deltas in the other two
 17:19:57 **12** exhibits; correct?
 17:19:58 **13** **A.** I don't know if I'd agree with that.
 17:19:59 **14** **Q.** You do see that there's a change in
 17:20:02 **15** temperature; correct?
 17:20:02 **16** **A.** I do.
 17:20:03 **17** **Q.** And you also see that there's a change in
 17:20:06 **18** velocity; correct?
 17:20:08 **19** **A.** Yes.
 17:20:09 **20** **Q.** And you also see that there is a change in
 17:20:12 **21** the velocity vectors.
 17:20:13 **22** **A.** Yes.
 17:20:14 **23** **Q.** Okay. And if you compare Exhibit Number 27
 17:20:21 **24** to Exhibit Number 25, looking at the delta and
 17:20:26 **25** velocity vectors, there's a significant change in
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17:20:37 **1** velocity vectors as the simulation runs longer;
 17:20:43 **2** correct?
 17:20:44 **3** **A.** I would disagree.
 17:20:45 **4** **Q.** Okay. Do you see significant change on the
 17:20:51 **5** right-hand side of the operating room depicted in
 17:20:56 **6** Exhibit Number 25, page 3?
 17:21:03 **7** **A.** I do not.
 17:21:08 **8** **Q.** Do you see --
 17:21:09 **9** You do understand that there are more --
 17:21:14 **10** there's more color in Exhibit 27 as there is in
 17:21:17 **11** Exhibit 25 when looking at the velocity vector
 17:21:21 **12** difference.
 17:21:22 **13** **A.** I disagree.
 17:21:24 **14** **Q.** You disagree?
 17:21:44 **15** You understand that the scales are different
 17:21:46 **16** between Exhibit 25 and 27; correct?
 17:21:48 **17** **A.** Yes.
 17:21:50 **18** **Q.** And Exhibit 27 the scale goes from zero to
 17:21:54 **19** .67; correct?
 17:21:57 **20** **A.** Incorrect.
 17:22:02 **21** **Q.** What's the scale on Exhibit 27 for velocity
 17:22:04 **22** vector difference?
 17:22:06 **23** **A.** Zero to .6378.
 17:22:09 **24** **Q.** You're right. I misspoke.
 17:22:10 **25** And the scale with respect to Exhibit 25
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17:22:15 **1** goes from zero to .1781; correct?
 17:22:18 **2** **A.** That is correct.
 17:22:20 **3** **Q.** And if you put the exhibits next to each
 17:22:25 **4** other so that the camera can see, the overhead camera.
 17:22:34 **5** THE VIDEOGRAPHER: You can just keep them
 17:22:36 **6** right there.
 17:22:36 **7** **Q.** You can keep them right there.
 17:22:38 **8** Do you see a difference, a visual difference
 17:22:40 **9** between Exhibit 27 and Exhibit 25?
 17:22:43 **10** **A.** Yes, I do.
 17:22:46 **11** **Q.** And you see more color, or more areas of
 17:22:53 **12** color in Exhibit 27 than Exhibit 25; correct?
 17:22:59 **13** **A.** I would agree that there are more areas of
 17:23:00 **14** color.
 17:23:04 **15** **Q.** And you agree with me that the delta in
 17:23:10 **16** vector -- velocity vectors increases over time.
 17:23:22 **17** **A.** I -- You cannot make that conclusion from
 17:23:25 **18** these two.
 17:23:26 **19** **Q.** Okay.
 17:23:34 **20** **A.** Would you like me to explain?
 17:23:36 **21** **Q.** Not yet.
 17:23:37 **22** You agree with me that there are some areas
 17:23:46 **23** of red on Exhibit 27; correct?
 17:23:53 **24** **A.** In the contour legend there is an area of
 17:23:56 **25** red.

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17:23:57 **1** **Q.** And there's a little bit of red kind of
 17:24:00 **2** above the, like the upper left-hand corner; correct?
 17:24:04 **3** Orange red?
 17:24:05 **4** **A.** Well that's the contour legend.
 17:24:07 **5** **Q.** I'm talking about in the operating room, in
 17:24:08 **6** the orange -- orangish-red.
 17:24:10 **7** **A.** I would say it's light orange.
 17:24:10 **8** **Q.** Okay.
 17:24:12 **9** **A.** I would say it's yellowish orange, but I
 17:24:15 **10** think we're quibbling over color.
 17:24:54 **11** **Q.** And as you said before, you would expect
 17:24:57 **12** over time the temperatures and velocity and the
 17:24:59 **13** velocity vectors would change because this is a
 17:25:01 **14** transient model.
 17:25:02 **15** **A.** I would expect --
 17:25:04 **16** Well they have to.
 17:25:06 **17** **Q.** And since velocity vectors, temperature and
 17:25:11 **18** velocity will have an effect on streamlines, the
 17:25:16 **19** streamlines will change over time.
 17:25:18 **20** **A.** And as I've said, they have to.
 17:25:20 **21** **Q.** Okay. Did you ever attempt to start your
 17:25:41 **22** streamlines at a different point besides the --
 17:25:44 **23** underneath the operating room table or from the
 17:25:47 **24** exhaust of the Bair Hugger?
 17:25:49 **25** **A.** Yes.

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17:25:50 **1** **Q.** And did you find any streamlines going over
 17:25:52 **2** the surgical site?
 17:25:55 **3** **A.** In this journal paper which is Exhibit 3, I
 17:25:58 **4** show photographs of streamlines that are started at
 17:26:02 **5** two locations not the two you've listed. And this is
 17:26:08 **6** in Figures 12 and 13.
 17:26:15 **7** MR. GOSS: I assume your question wasn't
 17:26:16 **8** limited to 2540.
 17:26:18 **9** MR. ASSAAD: It was, but since we're going
 17:26:19 **10** to go -- since he started, I'm going to follow up
 17:26:22 **11** just a little bit.
 17:26:22 **12** MR. GOSS: That's fine.
 17:26:23 **13** BY MR. ASSAAD:
 17:26:24 **14** **Q.** So in Figures 12 and 13 you show streamlines
 17:26:32 **15** coming from the Bair Hugger hose?
 17:26:40 **16** **A.** No.
 17:26:41 **17** **Q.** Or the -- the vapor generator?
 17:26:49 **18** **A.** Yes.
 17:26:54 **19** **Q.** And where did those streamlines start from?
 17:26:58 **20** **A.** They started from the exit of the vapor
 17:27:01 **21** generator's hose.
 17:27:04 **22** **Q.** And did you run a new model to get these
 17:27:07 **23** streamlines?
 17:27:08 **24** **A.** No.
 17:27:09 **25** **Q.** How'd you get these streamlines?

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17:27:12 **1** **A.** I released streamlines from the approximate
 17:27:15 **2** location where that hose was.
 17:27:17 **3** **Q.** Okay. And this wasn't in your original
 17:27:19 **4** report that was submitted in the Court; correct?
 17:27:22 **5** **A.** That is correct.
 17:27:25 **6** **Q.** Did you try running streamlines from
 17:27:27 **7** anywhere else?
 17:27:29 **8** **A.** Not that I recall.
 17:27:41 **9** Oh yes, actually. I ran streamlines from
 17:27:43 **10** the ventilation system.
 17:27:45 **11** **Q.** I understand. Okay.
 17:28:02 **12** Now going to your report, I want you to turn
 17:28:08 **13** to Figure 7, Exhibit 1. And that's showing
 17:28:25 **14** temperature gradient as a result of the warm air
 17:28:29 **15** coming out of the Bair Hugger; correct?
 17:28:31 **16** **A.** No.
 17:28:32 **17** **Q.** What's it showing?
 17:28:33 **18** **A.** It's showing temperature.
 17:28:35 **19** **Q.** Okay. So it's showing temperature at the
 17:28:38 **20** Bair Hug -- of the air as the -- of the -- of the --
 17:28:43 **21** around where the Bair Hugger is exiting warm air;
 17:28:45 **22** correct?
 17:28:46 **23** **A.** Yes.
 17:28:57 **24** **Q.** And if you look at...
 17:29:09 **25** I don't think you have it in your report,
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17:29:11 **1** but you agree with me that if you followed the
 17:29:14 **2** streamlines looking at the same view of Figure 7, you
 17:29:19 **3** would see the streamlines are moving upward direction;
 17:29:22 **4** correct?
 17:29:24 **5** **A.** In the general upward direction, correct.
 17:29:27 **6** **Q.** Because of buoyancy; correct?
 17:29:29 **7** **A.** Correct.
 17:29:30 **8** **Q.** Okay. And you agree with me that there's
 17:29:36 **9** enough buoyancy in the air coming from the Bair Hugger
 17:29:42 **10** exit that overcomes the downward air coming from the
 17:29:50 **11** inlets --
 17:29:51 **12** **MR. GOSS:** Object to form.
 17:29:52 **13** **Q.** -- at that -- around the Bair Hugger --
 17:29:54 **14** around the surgical drape.
 17:29:56 **15** **A.** I would disagree.
 17:29:57 **16** **Q.** Okay. So the air is not going up?
 17:30:04 **17** **A.** That's not your original question.
 17:30:07 **18** **Q.** Okay. The streamlines are -- would
 17:30:08 **19** basically go up as a result of buoyancy; correct?
 17:30:11 **20** **A.** They go in the general upward direction.
 17:30:13 **21** **Q.** Okay. Until the air cools down, and then it
 17:30:18 **22** would change direction; correct?
 17:30:20 **23** **A.** That would be one reason why it may change
 17:30:23 **24** direction.
 17:30:24 **25** **Q.** Okay. You do agree that right above that
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17:30:28 **1** surgical -- the -- the pole there, to the right of it
 17:30:32 **2** is a ventilation duct blowing cold air down. Do you
 17:30:38 **3** see that?
 17:30:40 **4** **A.** Yes.
 17:30:40 **5** **Q.** Okay. So even with the air going down from
 17:30:46 **6** the diffuser inlet, the air coming out of the Bair
 17:30:51 **7** Hugger still has an upward direction; correct?
 17:30:54 **8** **A.** Well I think you misstate -- you
 17:30:56 **9** misunderstand what's shown here. What's shown here is
 17:31:02 **10** -- And in fact I want to make sure this is clear for
 17:31:04 **11** the camera.
 17:31:06 **12** The warm air comes out and it's basically
 17:31:09 **13** going horizontal. Now why is it going horizontally?
 17:31:14 **14** Because it is pushed horizontally by the air coming
 17:31:17 **15** out of the ventilation, which is right here
 17:31:20 **16** [indicating]. When the warm air moves beyond that
 17:31:23 **17** ventilation area only --
 17:31:24 **18** **Q.** Dr. Abraham, just one quick --
 17:31:26 **19** I'll let you finish, but I'm not your
 17:31:28 **20** student. Just answer the question. So don't -- You
 17:31:31 **21** know, don't teach, just answer my question as to why
 17:31:33 **22** the air is -- is going up or I'm misunderstanding
 17:31:38 **23** something.
 17:31:38 **24** **A.** Could you restate the question?
 17:31:39 **25** **Q.** Sure.
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17:31:50 **1** And I'm going to break it in parts just so
 17:31:52 **2** we're clear. The air --
 17:31:54 **3** There is a diffuser right above and to the
 17:31:58 **4** right of the pole that's blowing 15 degrees Celsius
 17:32:02 **5** air downwards; correct?
 17:32:04 **6** **A.** I don't know if it's directly above the
 17:32:07 **7** pole. There is a diffuser in the ceiling, but I can't
 17:32:11 **8** say if it's directly above the pole, because the
 17:32:15 **9** diffusers are not continuous.
 17:32:25 **10** **Q.** Well if you look at page 2 of your report,
 17:32:30 **11** you see that there's diffusers there, and it looks
 17:32:35 **12** like it's to the right and above the pole?
 17:32:40 **13** **A.** Well yeah, but your question was is it
 17:32:42 **14** directly above the pole, and I can't tell from this
 17:32:47 **15** oblique view if it is directly above the pole. So I'm
 17:32:50 **16** just clarifying, the diffusers extend to the right,
 17:32:55 **17** but I don't know from this image or any image in the
 17:32:57 **18** report whether they are directly above the pole, and
 17:32:59 **19** that's the clarification I'm trying to make.
 17:33:01 **20** **Q.** Let's look it at it this way then. If you
 17:33:03 **21** look at figure number 4 you see air coming down from
 17:33:10 **22** the diffusers; correct?
 17:33:12 **23** **A.** That is correct.
 17:33:12 **24** **Q.** And it's coming to the left and right of the
 17:33:14 **25** pole and from the center of the pole, and -- like to
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17:33:17 **1** the left and right and within the pole area.
 17:33:19 **2** **A.** I think Figure 4 is a foot view. In fact
 17:33:22 **3** the caption says from the foot view of the surgical
 17:33:24 **4** table, so the pole is not visible in this image.
 17:33:29 **5** **Q.** You don't see the pole there to the right in
 17:33:31 **6** Figure 3?
 17:33:34 **7** **A.** Oh, I thought you were in Figure 4.
 17:33:38 **8** **Q.** Did I say Figure 4?
 17:33:39 **9** **MR. GOSS:** You said 4.
 17:33:40 **10** **MR. ASSAAD:** Okay. I'm sorry.
 17:33:41 **11** **Q.** Figure 3.
 17:33:42 **12** **A.** Okay.
 17:33:42 **13** **MR. GOSS:** Three.
 17:33:45 **14** **A.** Okay. In Figure 3 we see a pole, we see
 17:33:50 **15** downward air from the vent, but again this is a
 17:33:54 **16** two-dimensional image. So you asked is the vent
 17:33:57 **17** directly above the pole, and from this image I cannot
 17:34:00 **18** tell if the vent is directly above the pole.
 17:34:02 **19** **Q.** Let me --
 17:34:03 **20** Let's even make it simpler. You would agree
 17:34:07 **21** with me that there's a vent to the right of the pole
 17:34:08 **22** looking at Figure 7 in your report.
 17:34:15 **23** **A.** I believe that's the case, yes.
 17:34:17 **24** **Q.** Okay. And that's blowing down cold air at
 17:34:19 **25** 15 degrees Celsius; correct?

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17:34:21 **1** **A.** Correct.
 17:34:21 **2** **Q.** Okay. And you agree with me that if you
 17:34:25 **3** look at Figure 3, that there is air being blown down
 17:34:42 **4** from -- Let me rephrase that.
 17:34:49 **5** You agree with me that there's air being
 17:34:51 **6** blown down from the diffusers that's going to be over
 17:34:56 **7** the region of where the air is exiting from the Bair
 17:35:00 **8** Hugger.
 17:35:00 **9** **A.** I believe that's the case, but I can't
 17:35:03 **10** confirm it from this image.
 17:35:05 **11** **Q.** Okay. But based on your work on this case
 17:35:09 **12** you have no reason to disagree with that; correct?
 17:35:11 **13** **A.** Well, I mean, I would want to look at the fi
 17:35:14 **14** -- the CAD files to verify. So I cannot say one way
 17:35:17 **15** or another where the vents are exactly with respect to
 17:35:22 **16** the operating table.
 17:36:17 **17** **Q.** Assume for my question that the ventilation
 17:36:19 **18** is over the Bair Hugger area where the Bair Hugger air
 17:36:24 **19** is exiting the Bair Hugger blanket, the inlet.
 17:36:31 **20** You understand my question? Assume that
 17:36:33 **21** fact.
 17:36:33 **22** **A.** Yes.
 17:36:34 **23** **Q.** You agree with me that there is cold air
 17:36:37 **24** from the diffuser going down onto -- over the area
 17:36:42 **25** where the air is exiting the Bair Hugger. Assuming

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17:36:45 **1** that fact to be true.
 17:36:46 **2** **A.** That may or may not be true.
 17:36:49 **3** **Q.** Okay. If that is true in this case, you
 17:36:51 **4** agree with me that the air is still rising, the hot --
 17:36:56 **5** the warm air is still rising even though there is a
 17:37:00 **6** downward flow from the diffuser.
 17:37:04 **7** **A.** No.
 17:37:06 **8** **Q.** You disagree with that.
 17:37:07 **9** **A.** Well, I mean, let's look at Figure 7. So
 17:37:10 **10** Figure 7 is shown on the camera.
 17:37:13 **11** So as I understand it what you're saying,
 17:37:15 **12** and I'm not going to write on this, but you're saying
 17:37:18 **13** that there is some diffuser that extends over the
 17:37:22 **14** anesthesia drape. I think that's true.
 17:37:24 **15** **Q.** Yes.
 17:37:26 **16** **A.** Okay. We -- You haven't said how far it
 17:37:29 **17** extends, but let's assume it extends some distance
 17:37:31 **18** over. What we see is the flow is going almost
 17:37:34 **19** perfectly horizontal, or the tem -- let's say this,
 17:37:38 **20** the temperatures are in a pattern that is almost
 17:37:40 **21** perfectly horizontal.
 17:37:41 **22** Now at some point the flow takes an upward
 17:37:46 **23** trajectory. I -- I don't know where the diffuser
 17:37:51 **24** ends. I can guess that the diffuser extends beyond
 17:37:54 **25** the surgical drape and that's what keeps the flow from

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17:37:57 **1** rising, and then when you get out of that safe area or
 17:38:00 **2** that -- that diffuser area then the air starts to
 17:38:03 **3** rise, and I think that's all we can tell from this
 17:38:05 **4** image.
 17:38:06 **5** **Q.** But your --
 17:38:06 **6** But there definitely has an upward slope;
 17:38:09 **7** correct?
 17:38:09 **8** **A.** Oh. It is a very small upward slope.
 17:38:14 **9** **Q.** But there is an upward slope; yes?
 17:38:16 **10** **A.** A very small upward slope.
 17:38:18 **11** **Q.** Whether it's small or large, you agree with
 17:38:20 **12** me that it's an -- there's an upward slope; correct?
 17:38:22 **13** **A.** I would agree that there is an upward slope.
 17:38:52 **14** **Q.** Okay. Now you --
 17:38:54 **15** I'm going to change directions a little bit
 17:38:56 **16** and I want to talk about the Gareis case and the
 17:39:00 **17** Gareis operating room; correct?
 17:39:03 **18** Now you put in your report that you're not
 17:39:13 **19** -- you basically state, I do not offer my calculations
 17:39:15 **20** as proof of what would have occurred in the Gareis
 17:39:18 **21** case, but rather as a demonstration of airflow
 17:39:21 **22** patterns in a typical OR during the use of the Model
 17:39:24 **23** 505.
 17:39:24 **24** Did I read that correctly?
 17:39:25 **25** **A.** Yes.

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17:39:27 **1** **Q.** So is it -- are you going to offer any
 17:39:28 **2** opinions with respect to what is the airflow in the
 17:39:32 **3** Gareis case, in the Gareis -- in the Providence
 17:39:35 **4** operating room?
 17:39:36 **5** **A.** Well I'm --
 17:39:37 **6** My opinion is just what's written here, that
 17:39:41 **7** the flow patterns shown here are the typical flow
 17:39:45 **8** patter -- the flow patterns in a typical OR. The
 17:39:48 **9** Gareis case may have a different flow pattern, and I
 17:39:52 **10** didn't calculate that. So these are airflow patterns
 17:39:56 **11** in a typical OR, not necessarily the Gareis OR.
 17:40:00 **12** **Q.** Are you using your 505 model or CFD model to
 17:40:11 **13** support any of your opinions of the airflow that would
 17:40:17 **14** occur in the Gareis case?
 17:40:24 **15** **A.** Here's what I'll say. I did not model the
 17:40:28 **16** Gareis OR. I have modeled the typical -- And there
 17:40:33 **17** are differences between the Gareis OR and what I
 17:40:35 **18** modeled, and I'm acknowledging that.
 17:40:39 **19** My model is for a typical OR, the one that
 17:40:42 **20** we made the validating measurements in. I have seen
 17:40:45 **21** no evidence, despite trying, that Bair Hugger air can
 17:40:50 **22** influence the downward clean airflow in that OR, and I
 17:40:55 **23** have no reason to believe that it would influence the
 17:40:59 **24** airflow in the Gareis OR, but I did not model the
 17:41:03 **25** Gareis OR.

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17:41:04 **1** **Q.** And I understand that, sir. I'm just
 17:41:06 **2** wondering if you're using your -- Let me strike --
 17:41:11 **3** strike that.
 17:41:12 **4** Are you going to offer the opinion at trial
 17:41:14 **5** that the Bair Hugger 505 is not going to cause skin
 17:41:23 **6** squames to -- or particles to reach the operative
 17:41:28 **7** site?
 17:41:30 **8** **MR. GOSS:** In the Gareis OR?
 17:41:32 **9** **MR. ASSAAD:** Yes.
 17:41:34 **10** **A.** I'm going to answer that, and I'm actually
 17:41:39 **11** going to use my report. And I think I -- I'm taking a
 17:42:13 **12** little bit of time to look for it because I think that
 17:42:15 **13** I actually address this explicitly, so I apologize for
 17:42:19 **14** the time.
 17:42:34 **15** Okay. The calculation that I made differs
 17:42:43 **16** in some ways from the OR that was in the Gareis case.
 17:42:47 **17** I mention those in this report. For example, the dif
 17:42:52 **18** -- I'm reading from page 14 of Exhibit 1.
 17:42:57 **19** "In addition, the diffusers in Mr. Gareis's
 17:43:01 **20** OR create an 'air barrier' around the table,
 17:43:04 **21** potentially trapping contaminants shed by the surgical
 17:43:07 **22** staff within it."
 17:43:09 **23** Now what that means is I believe it is more
 17:43:12 **24** likely that skin squames, as you mentioned, from the
 17:43:15 **25** surgical staff would be carried to the site, but I

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17:43:18 **1** think it's less likely any potential Bair Hugger
 17:43:22 **2** airflow would interrupt that downward airflow.
 17:43:25 **3** **Q.** Is your basis with respect to the issue of
 17:43:27 **4** the Bair Hugger disrupting the Providence OR, is that
 17:43:31 **5** based on your CFD modeling of the 505 done in this
 17:43:41 **6** case?
 17:43:43 **7** **A.** The CFD modeling of the 505 shows that for
 17:43:48 **8** the OR that I modeled, not the Gareis OR, but the OR
 17:43:53 **9** that I modeled, the Bair Hugger air does not disrupt
 17:43:56 **10** the downward airflow.
 17:43:58 **11** **Q.** Does that he -- looking --
 17:43:59 **12** **A.** Here --
 17:44:00 **13** **Q.** Does that help you formulate your opinion
 17:44:02 **14** with respect to how the Bair Hugger is going to affect
 17:44:04 **15** the Gareis operating room?
 17:44:06 **16** **A.** It helps me formulate my opinion.
 17:44:09 **17** **Q.** Okay. So the basis of your opinion that the
 17:44:11 **18** Bair Hugger does not affect the operating -- operating
 17:44:21 **19** room used in the Gareis case is based on your
 17:44:23 **20** education, training and experience, and the results
 17:44:26 **21** that you obtained in your 505 modeling; correct?
 17:44:30 **22** **A.** And more than that.
 17:44:32 **23** **Q.** But is that correct so far?
 17:44:33 **24** If there's more, that's fine, but am I
 17:44:35 **25** correct?

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17:44:36 **1** **A.** Could you say it again?
 17:44:37 **2** **Q.** Okay. Your --
 17:44:39 **3** Your prediction or your opinion, within a
 17:44:42 **4** reasonable degree of engineering certainty, is that
 17:44:44 **5** the Bair Hugger is not going to have an effect on the
 17:44:48 **6** downward airflow in the Gareis operating room;
 17:44:51 **7** correct?
 17:44:52 **8** **A.** No. I wouldn't say that.
 17:44:54 **9** I would say this: I'm not making a
 17:44:55 **10** prediction about the Gareis OR. I'm not making a
 17:44:59 **11** prediction about the Gareis OR.
 17:45:01 **12** Here's what I am saying. I'm saying that I
 17:45:04 **13** simulated a different OR.
 17:45:06 **14** **Q.** I understand that, sir. I understand. My
 17:45:08 **15** question is simple.
 17:45:10 **16** Are you going to offer the opinion that the
 17:45:12 **17** Bair Hugger that was used in the Gareis case did not
 17:45:16 **18** affect the airflow in the Gareis OR?
 17:45:23 **19** **A.** The opinion I will offer is I have no
 17:45:25 **20** evidence, I've seen no evidence, and I have created no
 17:45:29 **21** evidence that the Bair Hugger would disrupt the
 17:45:31 **22** airflow in the Providence OR.
 17:45:33 **23** **Q.** But you have no evidence that it wouldn't,
 17:45:35 **24** either; correct?
 17:45:36 **25** **A.** Well that's not quite true, because you just

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17:45:39 **1** mentioned my simulation and my experience, evidence
 17:45:42 **2** and training, and I'm --
 17:45:43 **3** **Q.** Okay. And --
 17:45:43 **4** **A.** -- I've given you two --
 17:45:44 **5** **Q.** And that's my question, sir. I'm not trying
 17:45:46 **6** to interrupt you, I'm just running out of time.
 17:45:48 **7** You're going to rely on your education;
 17:45:50 **8** correct?
 17:45:51 **9** **A.** Yes.
 17:45:51 **10** **Q.** Your training; correct?
 17:45:53 **11** **A.** Yes.
 17:45:53 **12** **Q.** Your experience; correct?
 17:45:54 **13** **A.** Yes.
 17:45:56 **14** **Q.** And the information you obtained from the
 17:45:59 **15** 505 modeling of the CFD in a different operating room;
 17:46:03 **16** correct?
 17:46:06 **17** **A.** Correct.
 17:46:06 **18** **Q.** To formulate your opinion that the Bair
 17:46:10 **19** Hugger that was used in the Gareis case, in the Gareis
 17:46:15 **20** OR is not going to result in increased number of
 17:46:19 **21** squames or cause an increased number of squames over
 17:46:22 **22** the surgical site; correct?
 17:46:23 **23** **MR. GOSS:** I object to form.
 17:46:39 **24** **A.** Here's what I'm going to --
 17:46:41 **25** Here's what I'm prepared to testify at
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17:46:43 **1** trial. The Bair Hugger does not disrupt clean airflow
 17:46:47 **2** in a typical OR.
 17:46:50 **3** **Q.** Is the Gareis operating room a typical OR?
 17:46:52 **4** **A.** I do not believe it is a typical OR. I
 17:46:54 **5** believe the Gareis operating room, based on my
 17:46:57 **6** experience, education and training, would make it less
 17:46:59 **7** likely that Bair Hugger air would influence the
 17:47:03 **8** downward airflow, but I didn't simulate it so I can't
 17:47:06 **9** say with absolute certainty.
 17:47:08 **10** **Q.** Okay. I'm asking for a reasonable degree of
 17:47:11 **11** medical certainty, which is more than 50 percent. Do
 17:47:15 **12** you understand that?
 17:47:15 **13** **A.** I don't -- I'm not familiar with a
 17:47:17 **14** "reasonable degree of medical certainty."
 17:47:20 **15** **Q.** Or, I'm sorry, "engineering certainty."
 17:47:23 **16** Are you familiar with a reasonable degree of
 17:47:24 **17** engineering certainty?
 17:47:25 **18** **A.** Yes.
 17:47:26 **19** **Q.** Okay. What I'm trying to figure out, and
 17:47:29 **20** we've been going around in circles, is are you going
 17:47:33 **21** to offer the opinion that the Bair Hugger would not
 17:47:35 **22** cause squames to reach the operative site in the
 17:47:39 **23** Gareis OR; "yes" or "no"?
 17:47:48 **24** **A.** I will offer this opinion. I have no
 17:47:52 **25** evidence, I have seen no evidence that it could.
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17:47:57 **1** **Q.** Have you seen --
 17:47:58 **2** **A.** I did not simulate the Gareis OR.
 17:48:00 **3** **Q.** Have you seen any evidence to sup --
 17:48:02 **4** Well my question is: I understand you've
 17:48:04 **5** seen no evidence, according to you, that it could, but
 17:48:07 **6** are you going to offer the opinion that the Bair
 17:48:10 **7** Hugger would have no effect on the airflow in the
 17:48:13 **8** Gareis operating room and cause no squames to reach
 17:48:17 **9** the surgical site?
 17:48:18 **10** **MR. GOSS:** I think that's compound. And I
 17:48:21 **11** think he said what he's going to testify to.
 17:48:24 **12** **MR. ASSAAD:** He has not.
 17:48:25 **13** **MR. GOSS:** Well I think -- I think he said
 17:48:27 **14** exactly what he's going to testify to, and you're
 17:48:29 **15** trying to put a different opinion on him.
 17:48:31 **16** But if you have a different answer, you can
 17:48:34 **17** offer it.
 17:48:35 **18** **A.** I don't have a different answer.
 17:48:38 **19** I believe the Bair Hugger will have some
 17:48:41 **20** effect on any room. I have seen no evidence -- My
 17:48:47 **21** simulation was on the Southdale OR only, and based on
 17:48:52 **22** that simulation and my understanding that that's a
 17:48:55 **23** typical OR, I offer the opinion that I don't believe
 17:49:00 **24** the Bair Hugger could bring any unclean air into the
 17:49:04 **25** surgical site in that type of OR.
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17:49:06 **1** **Q.** What about in the Gareis OR?
 17:49:07 **2** **A.** I have not simulated the Gareis OR.
 17:49:09 **3** **Q.** So you're going to offer no opinion with
 17:49:11 **4** respect to whether or not the Bair Hugger could cause
 17:49:14 **5** increased squames to reach the surgical site in the
 17:49:17 **6** Gareis OR because you have not simulated it; correct?
 17:49:21 **7** **MR. GOSS:** Object to form.
 17:49:24 **8** **A.** I would say that this -- my calculations are
 17:49:25 **9** not predictions of what would happen in the Gareis OR,
 17:49:29 **10** they are demonstratives of what happens in a typical
 17:49:32 **11** OR.
 17:49:32 **12** **Q.** Are you going to use that demonstrative and
 17:49:36 **13** your calculations to offer opinions at trial with
 17:49:39 **14** respect to whether or not the Bair Hugger increases
 17:49:48 **15** particles over the sterile field in the Gareis case?
 17:49:52 **16** **A.** I did not simulate any increase of
 17:49:55 **17** particles. I didn't model particles.
 17:50:01 **18** **Q.** Let me ask it this way: And I'm just trying
 17:50:04 **19** to understand what you're going to testify at trial,
 17:50:05 **20** and that's why I'm here today.
 17:50:07 **21** Are you going to offer any opinions at trial
 17:50:19 **22** in the Gareis case of whether or not the Bair Hugger
 17:50:24 **23** 505 device affects or impacts the OR airflow to an
 17:50:40 **24** extent in which particles may be in contact with the
 17:50:54 **25** sterile field?
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17:50:57 **1** **A.** That was long. Let me read it. (Witness
 17:51:06 **2** reviewing realtime screen.)
 17:51:16 **3** Well I'll just say this. My -- I'm going to
 17:51:19 **4** give my answer. These results are not predictive of
 17:51:23 **5** what would actually happen in the Gareis OR. They are
 17:51:27 **6** predictions in a typical OR like the one that was
 17:51:31 **7** modeled.
 17:51:32 **8** **Q.** I understand.
 17:51:34 **9** But based on your education, training, and
 17:51:37 **10** experience and the CFD modeling, do you have an
 17:51:40 **11** opinion, within a reasonable degree of engineering
 17:51:43 **12** probability, of whether or not the Bair Hugger will
 17:51:47 **13** have a impact on the airflow over the surgical site in
 17:51:53 **14** the Gareis case?
 17:51:55 **15** **MR. GOSS:** So now we've gone from is he
 17:51:57 **16** going to offer an opinion at trial to, do you have an
 17:51:59 **17** opinion.
 17:51:59 **18** **MR. ASSAAD:** Yes.
 17:52:01 **19** **A.** I do have an opinion.
 17:52:03 **20** **Q.** And what's your opinion?
 17:52:04 **21** **A.** My opinion is that the Bair Hugger would
 17:52:09 **22** not.
 17:52:09 **23** **Q.** And what's the basis of your opinion?
 17:52:16 **24** **A.** My experience, my training, my understanding
 17:52:21 **25** of how these blankets work, my review of the
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17:52:25 **1** literature and other people's studies, my own review,
 17:52:30 **2** I have seen no evidence in any OR that the Bair Hugger
 17:52:36 **3** will bring particles to the sterile site.
 17:52:39 **4** **Q.** And that's based also on your CFD analysis
 17:52:42 **5** and the OR models in your 505.
 17:52:45 **6** **A.** Boy, I don't know if I would go that far,
 17:52:47 **7** though, because this is a different room, so I don't
 17:52:52 **8** -- I don't know if I would go that far. I don't think
 17:52:54 **9** I need to go that far, and I don't know, sitting here,
 17:52:56 **10** if I would go that far.
 17:52:57 **11** **Q.** So basically what you're telling me is at
 17:53:00 **12** trial your 505 CFD modeling in the Gareis case is
 17:53:06 **13** irrelevant with respect to your opinions.
 17:53:08 **14** **MR. GOSS:** I'm going to object to form. He
 17:53:09 **15** has general cause opinions.
 17:53:12 **16** **A.** I disagree. It is not irrelevant.
 17:53:14 **17** **Q.** So it is relevant and it formulates your
 17:53:17 **18** education, training and experience with respect to how
 17:53:19 **19** the Bair Hugger acts in an operating room.
 17:53:21 **20** **A.** This 505 report is related to how a Bair
 17:53:26 **21** Hugger 505 would affect the airflow in a typical OR,
 17:53:31 **22** period. This report does not make any claims or
 17:53:36 **23** predictions about how the 505 would impact the airflow
 17:53:39 **24** in the Gareis OR, period.
 17:54:03 **25** **THE VIDEOGRAPHER:** We have 15 minutes
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17:54:05 **1** remaining.
 17:54:11 **2** **BY MR. ASSAAD:**
 17:54:11 **3** **Q.** So would it be accurate that with respect to
 17:54:17 **4** the effect of the Bair Hugger in the Gareis operating
 17:54:20 **5** room, you're not going to rely on the information you
 17:54:23 **6** obtained from your 505 CFD analysis?
 17:54:35 **7** **A.** (Witness reviewing realtime screen.) I am
 17:54:40 **8** not making any claim about the Bair Hugger effect in
 17:54:45 **9** the Gareis operating room, so I wouldn't rely on
 17:54:50 **10** information to make something I'm not going to claim.
 17:54:59 **11** **MR. ASSAAD:** Let's take a break.
 17:55:01 **12** **THE REPORTER:** Off the record, please.
 17:55:03 **13** (Recess taken from 5:55 to 6:02 p.m.)
 18:02:07 **14** **BY MR. ASSAAD:**
 18:02:19 **15** **Q.** Dr. Abraham, my questions now are going to
 18:02:22 **16** be dealing with specifically the Gareis case. You
 18:02:24 **17** understand that.
 18:02:25 **18** **A.** Yes.
 18:02:26 **19** **Q.** Okay. In short, you're offering the opinion
 18:02:33 **20** that the Bair Hugger cannot deposit squames containing
 18:02:37 **21** bacteria to the surgical site; correct?
 18:02:39 **22** **MR. GOSS:** Object to form.
 18:02:41 **23** **A.** My opinion is the Bair Hugger models that I
 18:02:46 **24** have modeled in the OR that I have modeled, there is
 18:02:51 **25** no evidence that the Bair Hugger would deposit squames
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18:02:53 **1** to the surgical site.
 18:02:54 **2** **Q.** I'm asking about the Gareis case.
 18:02:56 **3** **A.** My model is not the Gareis case, so I'm not
 18:03:00 **4** making predictions of what happened in the Gareis
 18:03:03 **5** case.
 18:03:32 **6** **Q.** So are you withdrawing your 505 model with
 18:03:36 **7** respect to what would occur in the Gareis case?
 18:03:43 **8** **MR. GOSS:** Object to form. I think that
 18:03:45 **9** goes to legal strategy, but I'll ask --
 18:03:51 **10** **MR. ASSAAD:** I understand that, Mr. Goss,
 18:03:52 **11** but I'm trying to figure out if he's going to offer
 18:03:55 **12** opinions with respect to what's going to happen in
 18:04:01 **13** the Gareis case because he -- his case-specific
 18:04:05 **14** report contains a 505 CFD model.
 18:04:08 **15** **MR. GOSS:** True.
 18:04:09 **16** **MR. ASSAAD:** Well let me ask you this: Is
 18:04:11 **17** he going to offer any opinions in the Gareis case
 18:04:13 **18** with respect to whether or not the Bair Hugger could
 18:04:16 **19** cause squames to -- containing bacteria to reach the
 18:04:20 **20** surgical site?
 18:04:21 **21** **MR. GOSS:** Well I'm not going to testify
 18:04:24 **22** about what the direct is going to be, but I think
 18:04:28 **23** he's already indicated what his opinions are and what
 18:04:33 **24** his -- what his views are on the extent to which you
 18:04:38 **25** can extend the 505 model to the specifics of the
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18:04:41 **1** Gareis case.
 18:04:42 **2** MR. ASSAAD: Okay.
 18:04:42 **3** BY MR. ASSAAD:
 18:05:01 **4** Q. Now with respect to --
 18:05:01 **5** This goes to your 505 model. You agree that
 18:05:04 **6** the 505 model, CFD model that you did only lasted 5.07
 18:05:12 **7** seconds; correct?
 18:05:17 **8** A. The results that are presented here were
 18:05:23 **9** extracted from the TRN file that corresponds to 5.07
 18:05:26 **10** seconds.
 18:05:27 **11** Q. And when you talk about the results you're
 18:05:29 **12** talking about the 60-second path -- streamlines;
 18:05:33 **13** correct?
 18:05:33 **14** A. That is correct.
 18:05:33 **15** Q. You do understand that Mr. Gareis' surgery
 18:05:35 **16** lasted longer than a minute.
 18:05:38 **17** A. I understand that.
 18:05:39 **18** Q. Okay. Much longer than a minute. Do you
 18:05:41 **19** understand that?
 18:05:42 **20** A. Yes.
 18:05:43 **21** Q. Do you even know how long it takes to do the
 18:05:45 **22** first incision on a hip arthroplasty?
 18:05:48 **23** A. I don't know that.
 18:06:19 **24** Q. With respect to your general cause report
 18:06:23 **25** regarding the 750, what specifically in that report
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18:06:27 **1** applies to the Gareis case?
 18:06:36 **2** A. Well, I mean, it's a different blower and
 18:06:40 **3** it's a different OR. What the general causation
 18:06:44 **4** report shows is what airflow would occur in an O -- in
 18:06:49 **5** that OR with that blower, and that in that OR with
 18:06:52 **6** that blower the Bair Hugger does not bring unclean air
 18:06:56 **7** to the surgical site.
 18:06:57 **8** It doesn't -- That general causation report
 18:06:59 **9** had nothing to do with the Gareis case.
 18:07:01 **10** Q. And my question is since it applies to that
 18:07:04 **11** operating room, according to you, and those scenarios,
 18:07:08 **12** your general causation report would not apply to what
 18:07:11 **13** occurs in the Gareis case; correct?
 18:07:13 **14** A. My general causation report would not be
 18:07:17 **15** predictive of what would happen in a Gareis OR, as
 18:07:22 **16** I've stated here with the 505.
 18:07:24 **17** Q. And you're not using your 750 CFD or -- IN
 18:07:29 **18** general causation, or your 505 CFD done in your
 18:07:34 **19** case-specific report to predict how the Bair Hugger is
 18:07:40 **20** going to affect airflow in the Gareis operating room;
 18:07:44 **21** correct?
 18:07:45 **22** A. I am not making any predictions about the
 18:07:48 **23** Bair Hugger and its effect of airflow in that OR.
 18:07:51 **24** That was not modeled.
 18:08:13 **25** MR. ASSAAD: Mr. Goss, are you going to
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18:08:15 **1** withdraw your case-specific opinions with respect to
 18:08:17 **2** the 505 CFD analysis since your expert just testified
 18:08:21 **3** that it's basically not relevant to the Gareis case?
 18:08:24 **4** MR. GOSS: No, of course not.
 18:08:24 **5** MR. ASSAAD: Okay.
 18:08:25 **6** MR. GOSS: No more than any of your experts
 18:08:27 **7** are not going to offer any general causation
 18:08:29 **8** testimony in the Gareis case. He -- It's a rebuttal
 18:08:54 **9** model.
 18:09:02 **10** Q. With respect to page 14 where you indicate
 18:09:05 **11** "...the diffusers in Mr. Gareis's OR create an 'air
 18:09:09 **12** barrier' around the table, potentially trapping
 18:09:11 **13** contaminants shed by the surgical staff within it."
 18:09:14 **14** Do you see that?
 18:09:15 **15** A. Yes.
 18:09:16 **16** Q. What's your basis for that opinion?
 18:09:21 **17** A. If you go to the next page and look at
 18:09:24 **18** Figure 18, I have highlighted where the diffusers are
 18:09:28 **19** in the ceiling, and you can see that the diffusers
 18:09:33 **20** create an air barrier, they're like a wall around the
 18:09:37 **21** surgical site -- around the operating room table.
 18:09:41 **22** Q. I'm running out of time, so keep it short.
 18:09:43 **23** You're basing it on Figure 18?
 18:09:45 **24** A. Well I need to explain it.
 18:09:46 **25** Q. I understand where you're going with it, but
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18:09:48 **1** you're basing it on Figure 18?
 18:09:50 **2** A. You may understand where I'm going with it.
 18:09:52 **3** Are you asking me not to explain it, or --
 18:09:54 **4** Q. Well I'll ask you to explain it if your
 18:09:56 **5** counsel will give me an extra ten more minutes, but if
 18:09:59 **6** not, I don't want to --
 18:09:59 **7** MR. GOSS: No. There's no more time. It's
 18:10:02 **8** disclosed in his report.
 18:10:02 **9** MR. ASSAAD: Okay.
 18:10:03 **10** Q. And you're making that opinion based on your
 18:10:05 **11** education, training and experience and your knowledge
 18:10:07 **12** of airflow; correct?
 18:10:08 **13** A. Yes.
 18:10:08 **14** Q. Okay. And you could look at Figure 18 and
 18:10:11 **15** as an engineer you can make predictions on an airflow
 18:10:15 **16** in an operating room based on your education, training
 18:10:17 **17** and experience.
 18:10:18 **18** A. You could make some predictions.
 18:10:34 **19** Q. But your basis with respect to the OR in the
 18:10:38 **20** Gareis room creating an air barrier is based on your
 18:10:43 **21** education, training and experience, and no calcula --
 18:10:46 **22** CFD calculations; correct?
 18:10:48 **23** A. And the layout of the diffusers in the
 18:10:51 **24** ceiling, which create a barrier around the table,
 18:10:53 **25** which is displayed in Figure 18.
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18:10:57 **1** Q. But it's not based on any CFD calculations;
 18:11:00 **2** correct?
 18:11:00 **3** A. That is correct.
 18:11:07 **4** Q. With respect to page 16, there's a picture
 18:11:11 **5** of the outlet vent in the Gareis operating room;
 18:11:15 **6** correct?
 18:11:16 **7** A. Yes.
 18:11:16 **8** Q. And you write, this vent draws air upwards
 18:11:19 **9** above the operating room table; correct?
 18:11:20 **10** A. That is correct.
 18:11:21 **11** Q. You did not provide any calculations or
 18:11:23 **12** conduct any calculations to -- to show that
 18:11:27 **13** conclusion; correct?
 18:11:29 **14** A. No. That conclusion is based on my
 18:11:31 **15** experience, education and training.
 18:12:34 **16** Q. Furthermore, with respect to the medical
 18:12:37 **17** equipment in the operating room, such as the
 18:12:39 **18** anesthesia machine, the electrocautery device, you did
 18:12:45 **19** not perform any calculations to determine the effect,
 18:12:48 **20** if any, those devices might have on the airflow in the
 18:12:51 **21** Gareis operating room; correct?
 18:12:53 **22** A. That is correct.
 18:12:53 **23** Q. And you're not going to offer any opinions
 18:12:55 **24** with respect to the effect of those devices on the
 18:12:58 **25** airflow in the operating room; correct?
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18:13:00 **1** MR. GOSS: Object to form.
 18:13:01 **2** A. I think what I can say categorically is that
 18:13:09 **3** anything that generates heat may cause an upward air
 18:13:12 **4** motion, buoyancy, but I would not make a prediction
 18:13:14 **5** about how that would affect the airflow in the Gareis
 18:13:17 **6** OR.
 18:13:18 **7** Q. So you're not going to offer any opinions
 18:13:20 **8** within a reasonable degree of medical -- engineering
 18:13:22 **9** probability, that the anesthesia machine, or the Bovie
 18:13:27 **10** machine, or any other equipment in the Gareis
 18:13:29 **11** operating room had a significant effect on the airflow
 18:13:37 **12** in the operating room.
 18:13:39 **13** MR. GOSS: Object to form.
 18:13:40 **14** A. Correct.
 18:14:21 **15** Q. With respect to your published article, have
 18:14:24 **16** you received any questions or emails from other people
 18:14:34 **17** -- other people in your field regarding what was
 18:14:35 **18** published in *Numerical Heat Transfer*?
 18:14:38 **19** A. I don't recall receiving any questions or
 18:14:40 **20** emails on it. It's possible I've got an email, but I
 18:14:43 **21** don't recall any emails or questions.
 18:14:45 **22** Q. And have you provided -- before you
 18:14:48 **23** submitted the transcript did you give any copies -- or
 18:14:51 **24** the manuscript, I'm sorry, manuscript, to any of your
 18:14:55 **25** colleagues at St. Thomas --
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18:14:57 **1** A. No.
 18:14:57 **2** Q. -- to review?
 18:14:58 **3** A. No.
 18:14:58 **4** Q. Did you give it to any colleagues at the
 18:15:01 **5** University of Minnesota to review?
 18:15:02 **6** A. No.
 18:15:04 **7** Q. So sitting here today, with respect to your
 18:15:07 **8** published transcript, you received no comments or
 18:15:11 **9** reviews from anyone in -- any of your colleagues or --
 18:15:20 **10** in your field of mechanical engineering; is that
 18:15:23 **11** correct?
 18:15:23 **12** A. I received no comments on this paper from
 18:15:26 **13** any of my colleagues.
 18:15:28 **14** Q. Pre and post publication.
 18:15:30 **15** A. Correct.
 18:15:32 **16** MR. GOSS: Except for Dr. Minkowycz.
 18:15:34 **17** THE WITNESS: Right.
 18:15:34 **18** A. But I think you were talking about at my
 18:15:36 **19** university.
 18:15:37 **20** Q. Anywhere.
 18:15:38 **21** A. The only comments I've gotten was the letter
 18:15:40 **22** from the editor-in-chief.
 18:15:43 **23** Q. Okay.
 18:15:44 **24** MR. ASSAAD: That's all I have.
 18:15:46 **25** THE WITNESS: Okay.
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18:15:46 **1** MR. GOSS: Nothing.
 18:15:48 **2** MR. ASSAAD: I ask him to read and sign,
 18:15:50 **3** please.
 18:15:51 **4** MR. GOSS: Okay.
 18:15:51 **5** THE REPORTER: Off the record, please.
 18:15:53 **6** (Deposition concluded at 6:15 p.m.)
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1 CERTIFICATE

2 I, Debby J. Campeau, hereby certify that I
 3 am qualified as a verbatim shorthand reporter; that I
 4 took in stenographic shorthand the testimony of JOHN
 5 P. ABRAHAM, Ph.D., at the time and place aforesaid;
 6 and that the foregoing transcript consisting of 288
 7 pages is a true and correct, full and complete
 8 transcription of said shorthand notes, to the best of
 9 my ability; that the noticing party has been charged
 10 for the original transcript, and that each party has
 11 been charged the same amount for a copy of the
 12 transcript.

13 Dated at Lino Lakes, Minnesota, this 20th
 14 day of February, 2018.

15
 16
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 18 DEBBY J. CAMPEAU
 19 Notary Public
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 21
 22
 23
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 25

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1 SIGNATURE PAGE

2 I, JOHN P. ABRAHAM, Ph.D., the deponent, hereby
 3 certify that I have read the foregoing transcript,
 4 consisting of 288 pages, and that said transcript is
 5 a true and correct, full and complete transcription
 6 of my deposition, except per the attached
 7 corrections, if any.

8 PAGE LINE CHANGE/REASON FOR CHANGE

9 _____
 10 _____
 11 _____
 12 _____
 13 _____
 14 _____
 15 _____
 16 _____
 17 _____

18
 19 _____
 20 Date Signature of Witness

21
 22 WITNESS MY HAND AND SEAL this _____
 23 day of _____, 2018.

24
 25 (DJC) _____

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